Flood Damage Reduction
Shore & Bank Protection
Navigation

Water Resources Development

Kennebunk River

M A I N E

US Army Corps of Engineers
New England Division

On the Cover: *Kennebunk River, Wells, Maine*

The work of the U.S. Army Corps of Engineers in Maine

This booklet presents a brief description of water resources projects completed by the U.S. Army Corps of Engineers in Maine. It describes the role of the Corps in planning and building water resource improvements and explains the procedure leading to the authorization of such projects.

For ease of reference, the material is arranged according to the type of project, i.e. flood damage reduction, navigation, or shore and bank protection. There is also a reference at the end of the booklet that lists Corps' projects by community. A map showing the location of all Corps projects in the state, and an underleaf map delineating Corps' projects on the Maine coastline, is provided.

The Corps of Engineers water resources development program exerts a significant impact on Maine's physical, economic, and social environment. This publication affords citizens the opportunity to learn about the various projects and to determine how they can participate in decisions regarding present and future activities.

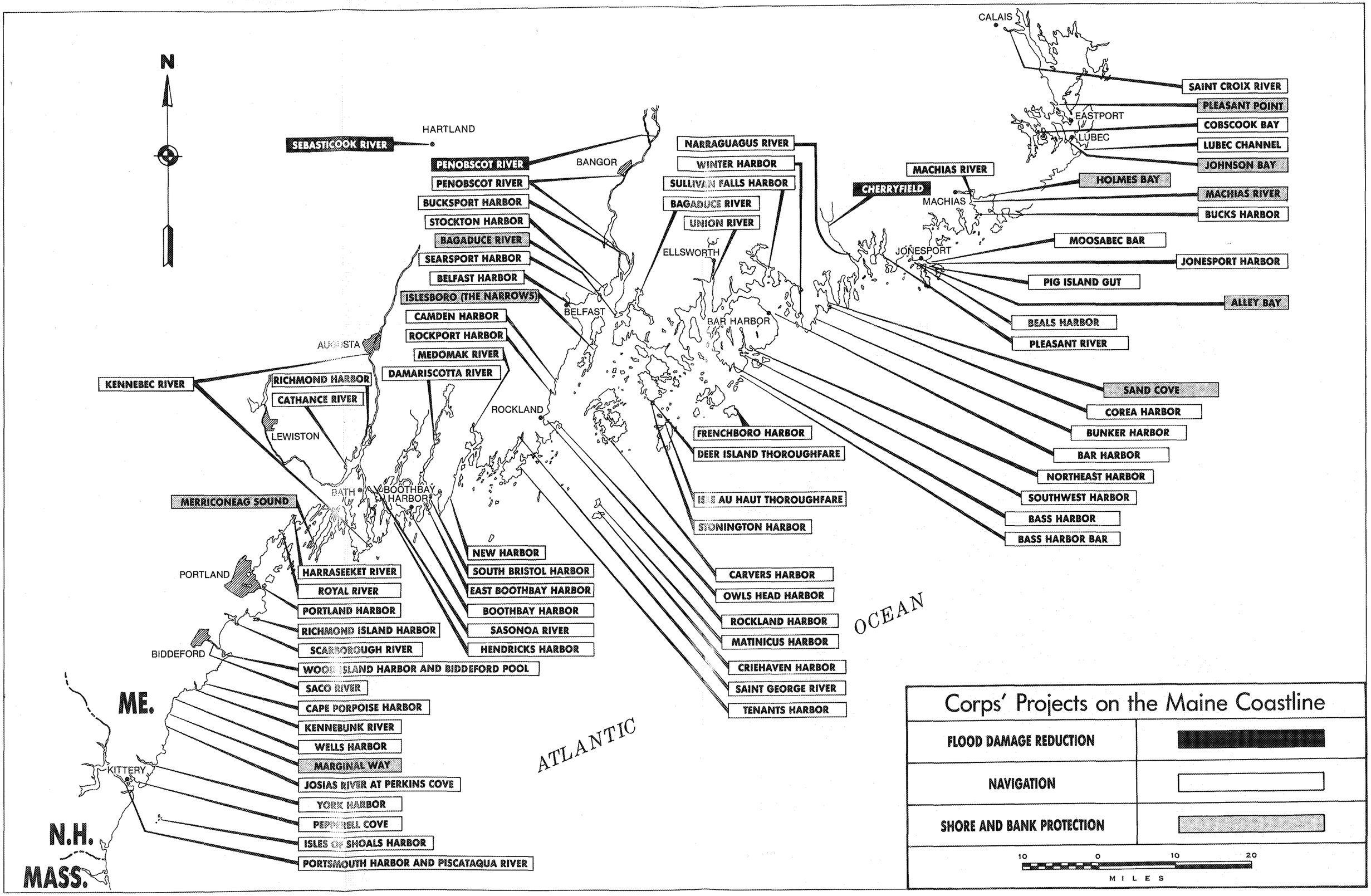
Before taking measures to resolve water resource problems, the New England Division performs individual studies on each affected area to determine if a Civil Works project is feasible. Each study examines a wide range of potential solutions based on economic and engineering practicality, acceptability, and impact on the environment. These on-going studies are discussed in detail in each of the quarterly New England Division State Update Reports which are available by request through the Public Affairs Office.

For further information, call the Corps of Engineers at 617-647-8237, or write:

U.S. Army Corps of Engineers
New England Division
Public Affairs Office
424 Trapelo Road
Waltham, MA 02254

US Army Corps of Engineers
New England Division

This publication is authorized by the Secretary of the Army as required by PL 99-662.

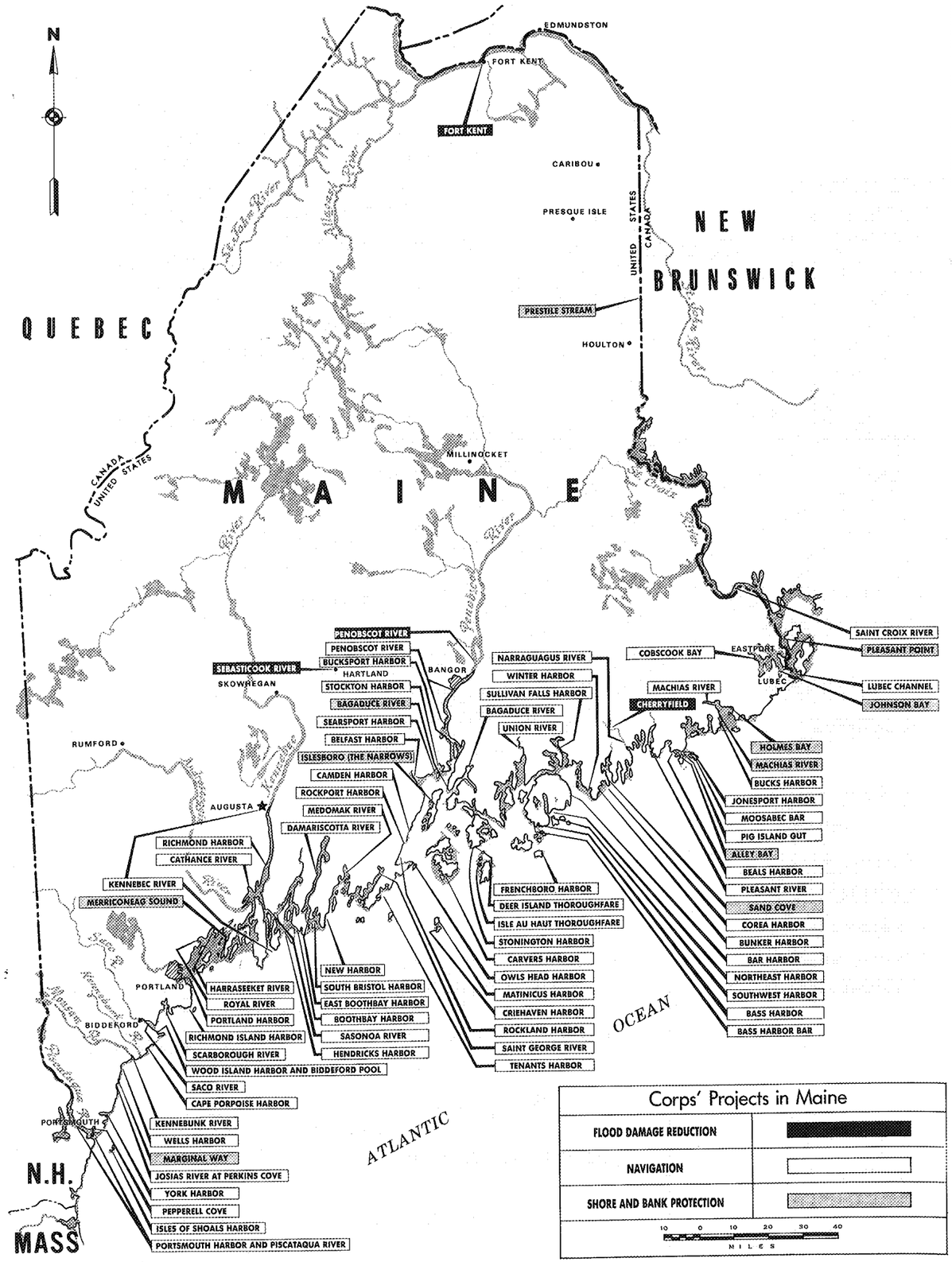


Corps' Projects on the Maine Coastline

FLOOD DAMAGE REDUCTION	
NAVIGATION	
SHORE AND BANK PROTECTION	

10 0 10 20

MILES


N
EDMUNDSTON
FORT KENT
FORT KENT
CARIBOU
PRESQUE ISLE
St. John River
Allagash River
UNITED STATES
CANADA
NEW
BRUNSWICK
QUEBEC
PRESTILE STREAM
HOULTON
MILLINOCKET
CANADA
UNITED STATES
M A I N E
Penobscot River
PENOBSCOT RIVER
PENOBSCOT RIVER
BUCKSPORT HARBOR
HARTLAND
SEBASTICOOK RIVER
SKOWHEGAN
BANGOR
STOCKTON HARBOR
BAGADUCE RIVER
SEARSPORT HARBOR
BELFAST HARBOR
ISLESBORO (THE NARROWS)
CAMDEN HARBOR
ROCKPORT HARBOR
MEDOMAK RIVER
DAMARISCOTTA RIVER
RUMFORD
AUGUSTA
RICHMOND HARBOR
CATHANCE RIVER
KENNEBEC RIVER
MERRICONEAG SOUND
Kennebec River
Androscoggin River
PORTLAND
BIDDEFORD
Saco R.
HARRASEEKET RIVER
ROYAL RIVER
PORTLAND HARBOR
RICHMOND ISLAND HARBOR
SCARBOROUGH RIVER
WOOD ISLAND HARBOR AND BIDDEFORD POOL
SACO RIVER
CAPE PORPOISE HARBOR
KENNEBUNK RIVER
WELLS HARBOR
MARGINAL WAY
JOSIAS RIVER AT PERKINS COVE
YORK HARBOR
PEPPERELL COVE
ISLES OF SHOALS HARBOR
PORTSMOUTH HARBOR AND PISCATAQUA RIVER
PORTSMOUTH
N.H.
MASS
NEW HARBOR
SOUTH BRISTOL HARBOR
EAST BOOTHBAY HARBOR
BOOTHBAY HARBOR
SASONOA RIVER
HENDRICKS HARBOR
NARRAGUAGUS RIVER
WINTER HARBOR
SULLIVAN FALLS HARBOR
BAGADUCE RIVER
UNION RIVER
FRENCHBORO HARBOR
DEER ISLAND THOROUGHFARE
ISLE AU HAUT THOROUGHFARE
STONINGTON HARBOR
CARVERS HARBOR
OWLS HEAD HARBOR
MATINICUS HARBOR
CRIEHAVEN HARBOR
ROCKLAND HARBOR
SAINT GEORGE RIVER
TENANTS HARBOR
ATLANTIC
OCEAN
COBSCOOK BAY
EASTPORT
LUBEC
MACHIAS RIVER
CHERRYFIELD
SAINT CROIX RIVER
PLEASANT POINT
LUBEC CHANNEL
JOHNSON BAY
HOLMES BAY
MACHIAS RIVER
BUCKS HARBOR
JONESPORT HARBOR
MOOSABEC BAR
PIG ISLAND GUT
ALLEY BAY
BEALS HARBOR
PLEASANT RIVER
SAND COVE
COREA HARBOR
BUNKER HARBOR
BAR HARBOR
NORTHEAST HARBOR
SOUTHWEST HARBOR
BASS HARBOR
BASS HARBOR BAR
Corps' Projects in Maine
FLOOD DAMAGE REDUCTION
NAVIGATION
SHORE AND BANK PROTECTION
10 0 10 20 30 40
MILES

US Army Corps
of Engineers
New England Division

To Our Readers:

The Corps of Engineers was formed some 218 years ago to be responsive to the needs of a young nation. And while the nature of our work has changed with time, our basic purpose remains — to be responsive to America's needs.

Clearly, the Nation's concern for the environment has permeated the Corps. Our environmental commitment has never been greater. Authority granted by the Water Resources Development Act of 1990 puts focus on the environment as a mission and promises restoration of wetlands and habitats for fish and wildlife. The 1992 legislation calls for the improvement and protection of our Nation's water resources infrastructure.

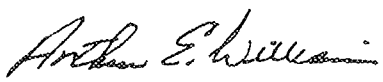
Responding to the recent outbreak of natural disasters has provided the Corps an outstanding opportunity to serve. From precise measures in controlling the precarious Chicago Flood, to the massive aid provided for the victims of Hurricanes Andrew and Iniki and Typhoon Omar, Corps people showed their courage, commitment and tenacity.

We continue responding to our customers' desires to be more involved with projects on a day-to-day basis. The Corps has achieved a major cultural shift with project management. It has resulted in greater accountability to our customers and ultimately projects which better reflect the needs of the community.

Partnering is yet another positive cultural shift in the Corps' business practices, particularly in civil works construction. A local sponsorship kit walks customers through the complexities of Corps projects. Under the Coastal America program, six federal agencies work together to solve environmental problems along the Nation's shoreline. A technique related to partnering, alternate dispute resolution, creates an atmosphere in which the clash of differing viewpoints can grow into creative solutions and prevent costly legal disputes.

And of course, we still respond to the needs of American families. As one of the Nation's largest providers of outdoor recreation, the Corps operates 461 lakes and other water resources projects. It's a responsibility we take seriously, using the opportunity to help others appreciate our valuable and delicate natural resources.

This booklet is one in a series detailing water resource programs in the 50 states and U.S. possessions. I hope you will find it interesting and feel some pride in ownership.



Arthur E. Williams
Lieutenant General, USA
Chief of Engineers

To Our Readers:

The U.S. Army Corps of Engineers has a long and proud history of applying its expertise in engineering and related disciplines to meet the Nation's needs. Over the years, its activities have evolved; however, since 1824, the central focus of its civil mission has been the development of the development of the Nation's water resources. With an annual program of over $3 billion for civil projects, the Corps is the Federal Government's largest water resources development agency. The Corps develops projects that have proven to be wise investments. These projects have reduced flood damages; provided safe, low cost waterborne transportation; generated hydroelectric power; provided water for the public, industry and agriculture; offered opportunities for recreation; and helped the environment. They return to the public benefits that far outweigh their costs.

Corps civil works activities reflect partnership. All Corps projects begin when non-Federal interests see a water-related problem and petition Congress for a solution. Under provisions of the Water Resources Development Act of 1986, once the Corps conducts a reconnaissance study to determine whether a feasible project is likely, these sponsors provide a share of the funding for the feasibility study upon which a project will be based. They also provide a share the cost of the project's design and construction once Congress has authorized the project and provided construction funds. During the period 1986-1994, non-Federal sponsors signed 286 cooperative agreements with the Department of the Army for cost sharing of project construction.

The Corps' engineering expertise and responsiveness has stood the Nation in good stead during times of natural disaster. During 1994, the Corps continued to rehabilitate levees damaged by the Midwest Flood of 1993 and responded to the Northridge, California, Earthquake and the floods that ravaged the Southeast.

Whatever challenges arise in the decades ahead, I have no doubt that the Army Corps of Engineers will be equal to the task.

John Zirschky

John H. Zirschky
Acting Assistant Secretary
of the Army (Civil Works)

Table of Contents

U.S. Army Corps of Engineers Programs and Services

Civil Works Overview

INTRODUCTION

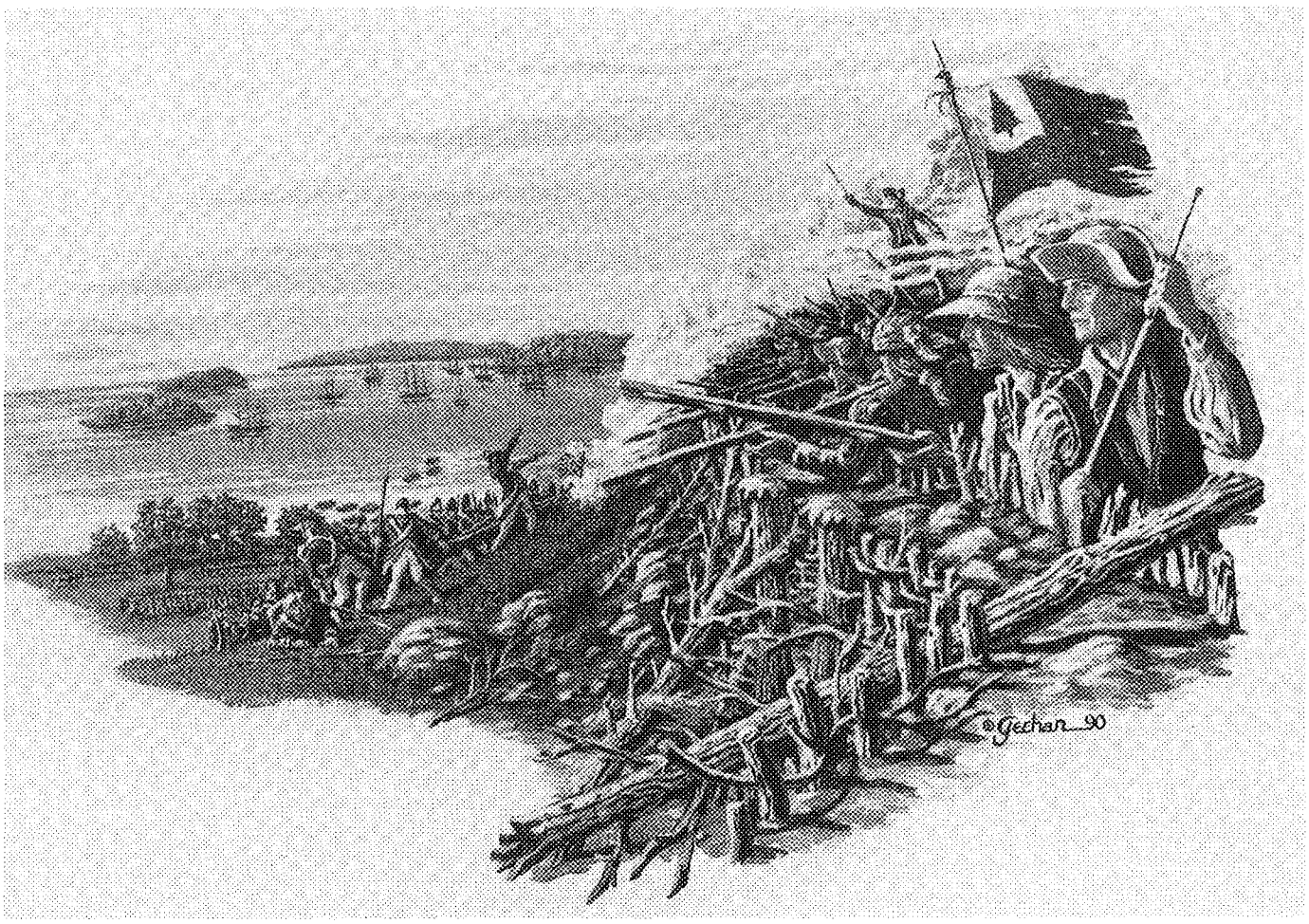
The Corps traces its history back to April 26, 1775, seven days after the first shots of the American Revolution were fired at Lexington, Massachusetts. Recognizing that the need for military engineering skill would be important in the war with England, the Massachusetts Provincial Congress appointed Boston native Richard Gridley to the rank of Colonel and Chief Engineer of the troops being raised in the colony.

In the early morning hours of June 17, 1775, Gridley, working under the cover of darkness, constructed a well-designed earthwork on Breed's Hill that proved practically invulnerable to British cannon. The British eventually took the hill (later called the Battle of Bunker Hill) when the patriots ran out of gunpowder, but at a cost in casualties greater than any other engagement of the war.

Gridley was to play other critical roles in the early days of the Revolution. On the evening of March 4, 1776, Gridley, along with 2000 men and 360 oxcarts loaded with entrenching materials, moved into Dorchester Heights. By daylight, two strong protective barriers looked down at the British. An astonished General Howe, Commander of the British forces, reportedly remarked that the Americans had done more in one night than his entire army would have done in six months. Exposed to the American batteries on Dorchester Heights and not strong enough to fight Washington's troops in other parts of Boston, the British army and fleet departed Boston on March 17, never again to occupy Massachusetts.

In 1802, Congress established a separate Corps of Engineers within the Army. At the same time, it established the U. S. Military Academy at West Point, the country's first — and for 20 years its only — engineering school. With the Army having the Nation's most readily available engineering talent, successive Congresses and administrations established a role for the Corps as an organization to carry out both military construction and works "of a civil nature."

Throughout the nineteenth century, the Corps supervised the construction of coastal fortifications, lighthouses, several early railroads, and many of the public buildings in Washington, D.C., and elsewhere. Meanwhile, the Corps of

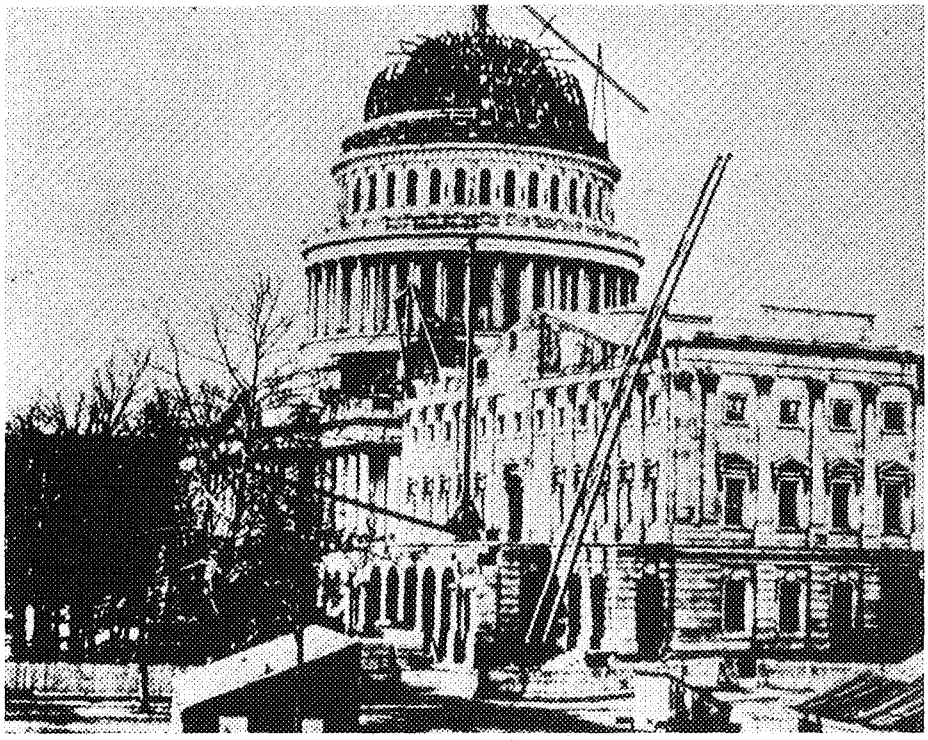


Under the direction of Colonel Richard Gridley, American patriots worked diligently throughout the early morning hours of June 17, 1775, designing a stout earthwork fortification that helped protect American soldiers from British cannonade in the historic Battle of Bunker Hill.

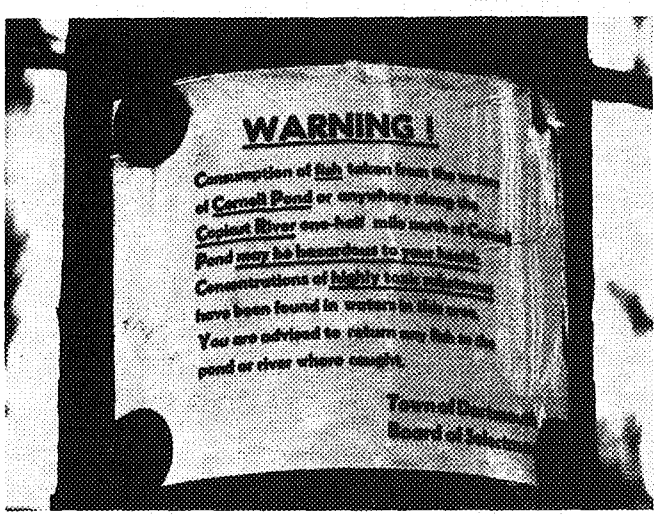
Topographical Engineers, which enjoyed a separate existence for 25 years (1838-1863), mapped much of the American West. Army Engineers served with distinction in war, with many Engineer officers rising to prominence during the Civil War.

In its civil role, the Corps of Engineers became increasingly involved with river and harbor improvements, carrying out its first harbor and jetty work in the first quarter of the nineteenth century. The Corps' ongoing responsibility for federal river and harbor improvements dates from 1824, when Congress passed two acts authorizing the Corps to survey roads and canals and to remove obstacles on the Ohio and Mississippi rivers. Over the years since, the expertise gained by the Corps in navigation projects led succeeding administrations and Congresses to assign new water-related missions in such areas as flood control, shore and hurricane protection, hydropower, recreation, water supply and quality, and wetland protection.

Today's Corps of Engineers carries out missions in three broad areas: military construction and engineering support to military installations; reimbursable support to other federal agencies (such as the Environmental Protection Agency's "Superfund" program to clean up hazardous and toxic waste sites); and the Civil Works mission, centered around navigation, flood control and — under the Water Resources Development Acts of 1986, 1988, 1990 and 1992 — a growing role in environmental restoration.



Army Engineers contributed to both planning and construction of our nation's capital. When the Capitol Building had to be reconstructed in 1857, the Corps built two new wings and redesigned the dome with cast and wrought iron. The completed dome, which weighed almost nine million pounds, was used by President Abraham Lincoln during the Civil War as a symbol of his intention to preserve the Union.



Cleaning chemical spills at hazardous waste sites is a team project between the Corps and the EPA. An area identified as a hazardous waste location was this site in Dartmouth, Massachusetts, near Cornell Pond and the Copicut River.

Authorization and Planning Process for Water Resources Projects

Corps of Engineers water resources activities are normally initiated by non-federal interests, authorized by Congress, funded by a combination of federal and non-federal sources, constructed by the Corps under the Civil Works Program and operated and maintained either by the Corps or by a non-federal sponsoring agency. New England Division has water resource responsibilities in all six New England states. The area assigned to New England Division contains 66,000 square miles, 13 million people, 6,100 miles of coastline, 13 major river basins and 11 deep draft commercial ports.

The Water Resources Development Act of 1986 made numerous changes in the way potential new water resources projects are studied, evaluated and funded. The major change is that the law now specifies greater non-federal cost sharing for most Corps water resources projects.

When local interests feel that a need exists for improved navigation, flood protection, or other water resources development, they may petition their representatives in Congress. A Congressional committee resolution or an act of Congress may then authorize the Corps of Engineers to investigate the problems and submit a report. Water resource studies are conducted in partnership with a non-federal sponsor, with the Corps and the sponsor jointly funding and managing the study.

Normally, the planning process for a water resource problem starts with a brief reconnaissance study to determine whether a project falls within the Corps' statutory authority and meets national priorities. Should that be the case, the Corps office where the project is located will carry out a full feasibility study to develop alternatives and select the best possible solution. This process normally includes public meetings to determine the views of local interests on the extent and type of improvements desired. The federal, state, and other agencies with interests in a project are partners in the planning process.

In making recommendations to Congress for project authorization, the Corps determines that the proposed project's benefits will exceed costs, its engineering design is sound, the project best serves the needs of the people concerned, and that it makes the wisest possible use of the natural resources involved and adequately protects the environment.

Once the Corps of Engineers completes its feasibility study, it submits a report, along with a final environmental impact statement, to higher authority for review and recommendations. After review and coordination with all interested federal agencies and the governors of affected states, the Chief of Engineers forwards the report and environmental statement to the Secretary of the Army, who obtains the views of the Office of Management and Budget before transmitting these documents to Congress.

If Congress includes the project in an authorization bill, enactment of the bill constitutes authorization of the project. Before construction can get underway, however, both the federal government and the project sponsor must provide funds. Budget recommendations are based on evidence of support by the state and the ability and willingness of the non-federal sponsors to provide its share of the project cost.

Appropriation of money to build a particular project is usually included in the annual Energy and Water Development Appropriations Bill, which must be approved by both Houses of the Congress and signed by the President.

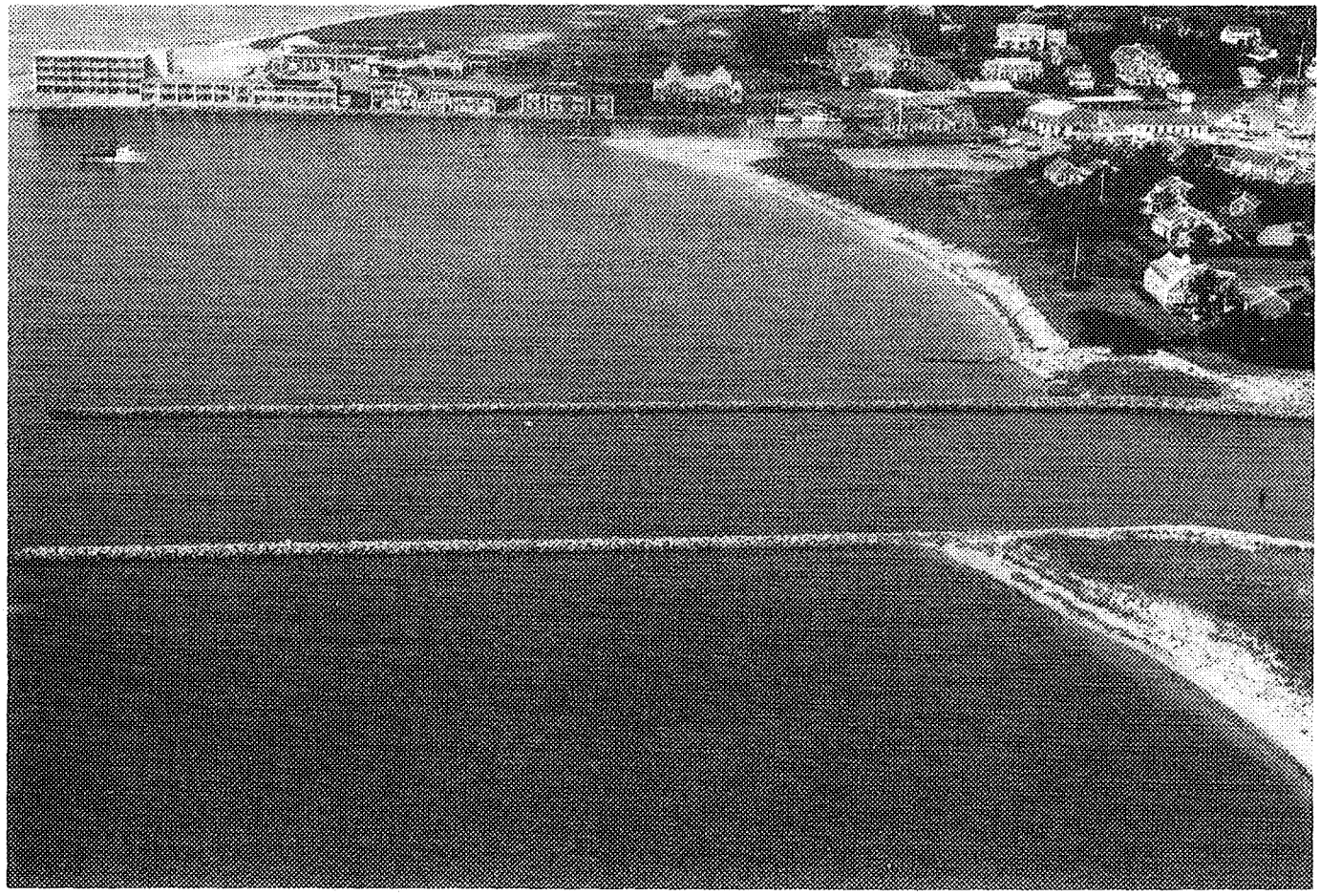
Navigation

Rivers and waterways were the primary paths of commerce in the new country. They provided routes from western farms to eastern markets. They promised a new life to the seaboard emigre and financial reward for the Mississippi Valley merchant. Without its great rivers, the vast, thickly-forested region west of the Appalachians would have remained impenetrable to all but the most resourceful early pioneers.

Consequently, western politicians such as Henry Clay agitated for federal assistance to improve rivers. At the same time, the War of 1812 showed the importance of a reliable inland navigation system to national defense. There was, however, a question as to whether transportation was, under the Constitution, a legitimate federal activity. This question was resolved when the Supreme Court ruled that the Commerce Clause of the Constitution granted the federal government the authority not only to regulate navigation and commerce, but also to make necessary navigation improvements.

The system of harbors and waterways maintained by the Corps of Engineers remains one of the most important parts of the nation's transportation system. The Corps maintains the nation's waterways as a safe, reliable and economically efficient navigation system. The 12,000 miles of inland waterways maintained by the Corps carry one sixth of the nation's inter-city cargo. The importance of the Corps mission in maintaining depths at more than 500 harbors, meanwhile, is underscored by an estimated one job in five in the United States being dependent, to some extent, on the commerce handled by these ports.

River and Harbor work by the Corps of Engineers in New England was initiated by a congressional appropriation of $20,000 on May 26, 1824, "to repair Plymouth Beach, in the Commonwealth of Massachusetts, and thereby prevent the harbor at that place from being destroyed." From that initial project at America's first permanent settlement, New England Division has completed 170 navigation projects, including 11 deep draft ports and adjacent waterways. The most visible of the Corps' navigation responsibilities in



Jetties help provide safe channels for commercial and recreational vessels. The jetties at Saquatucket Harbor in Harwich, Massachusetts, also help prevent the buildup of sediment in the channel by directing and confining the tidal flow.

New England is the Cape Cod Canal, which has been operated by the federal government since 1928. The canal is 17.5 miles long and is traversed by 19,000 vessels annually. In addition, its recreation features attract over 10 million annual visitors to the project.

Flood Control and Flood Plain Management

Federal interest in flood control began in the alluvial valley of the Mississippi River in the 19th Century. As the relationship of flood control and navigation became apparent, Congress called on the Corps of Engineers to use its navigational expertise to devise solutions to flooding problems along the river.

After a series of disastrous floods affecting wide areas in the 1920's and 30's, Congress determined, in the Flood Control Act of 1936, that the federal government would participate in the solution of problems affecting the public interest that were too large or complex to be handled by states or localities. Corps' authority for flood control work was thus extended to embrace the entire country. The Corps turns most of the flood control projects it builds over to non-federal authorities for operation and maintenance once construction is completed.

The purpose of flood control work is to prevent flood damage through regulation of the flow of water and other means. Prevention of flood-related damages can be accomplished with structural measures, such as reservoirs, levees, channels and floodwalls that modify the characteristics of floods; or non-structural measures, such as flood plain evacuation, floodproofing and floodway acquisition, that alter the way people use these areas and reduce the susceptibility of human activities to flood risk.

Corps' flood control reservoirs are often designed and built for multiple-purpose uses, such as municipal and industrial water supply, navigation, irrigation, hydroelectric power, conservation of fish and wildlife, and recreation.

The Corps fights the nation's flood problems not only by constructing and maintaining structures, but also by provid-

ing detailed technical information on flood hazards. Under the Flood Plain Management Services Program, the Corps provides, on request, flood hazard information, technical assistance and planning guidance to other federal agencies, states, local governments and private individuals. This information is designed to aid in planning for floods and regulation of flood plain areas, thus avoiding unwise development in flood-prone areas. Once community officials know the floodprone areas in their communities and how often floods would be likely to occur, they can take necessary action to prevent or minimize damages to existing and new buildings and facilities, such as adopting and enforcing zoning ordinances, building codes and subdivision regulations. The Flood Plain Management Services Program also provides assistance to other federal and state agencies in the same manner.

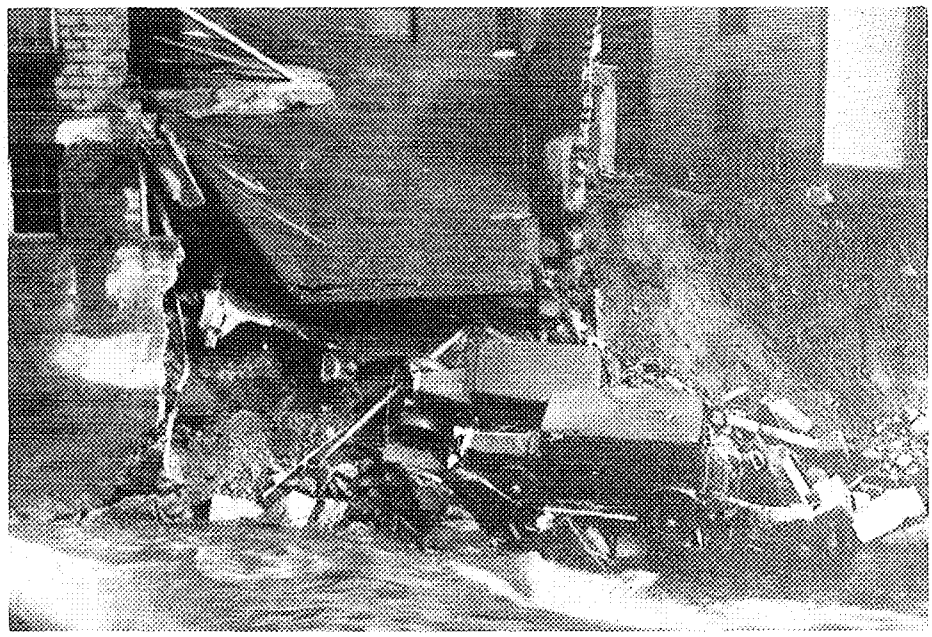
Flooding in New England

New England has a long history of flooding. Through the years it has been hit with various storms that have caused millions of dollars in damages. Some of the more destructive hurricanes and floods the area has experienced since 1900 occurred in November 1927; March 1936; September 1938; September 1954; and August 1955. However, some of the highest flood levels in New England history occurred in April 1987 and gave many Corps dams the most serious test since they were built. Despite having six dams discharge excess water over emergency spillways because reservoir capacities had been reached, the 31 dams under the jurisdiction of the Corps' New England Division held back billions of gallons of water that otherwise would have caused severe flooding downstream. The amount of water held back by these dams from this heavy rainfall was equivalent to a reservoir that could put the entire state of Rhode Island under more than one foot of water. Damages prevented by Corps flood control projects during the April 1987 storm amounted to $462.6 million. Damages prevented by operation of hurricane barriers during a coastal storm in December 1992 and the flood control dams in the spring of 1993 totaled another $104 million.

1927

Floodwaters swirl around homes and trees in this Vermont community during the November 1927 flood. The storm claimed 21 lives and caused $29.3 million in property damage.

1936



The rampaging waters of the North Nashua River ripped through the downtown area of Fitchburg, Massachusetts, during the March 1936 flood, taking with it homes, automobiles, and commercial and industrial property. Eleven lives were lost from this flood and damages were estimated at $66.4 million.

1936

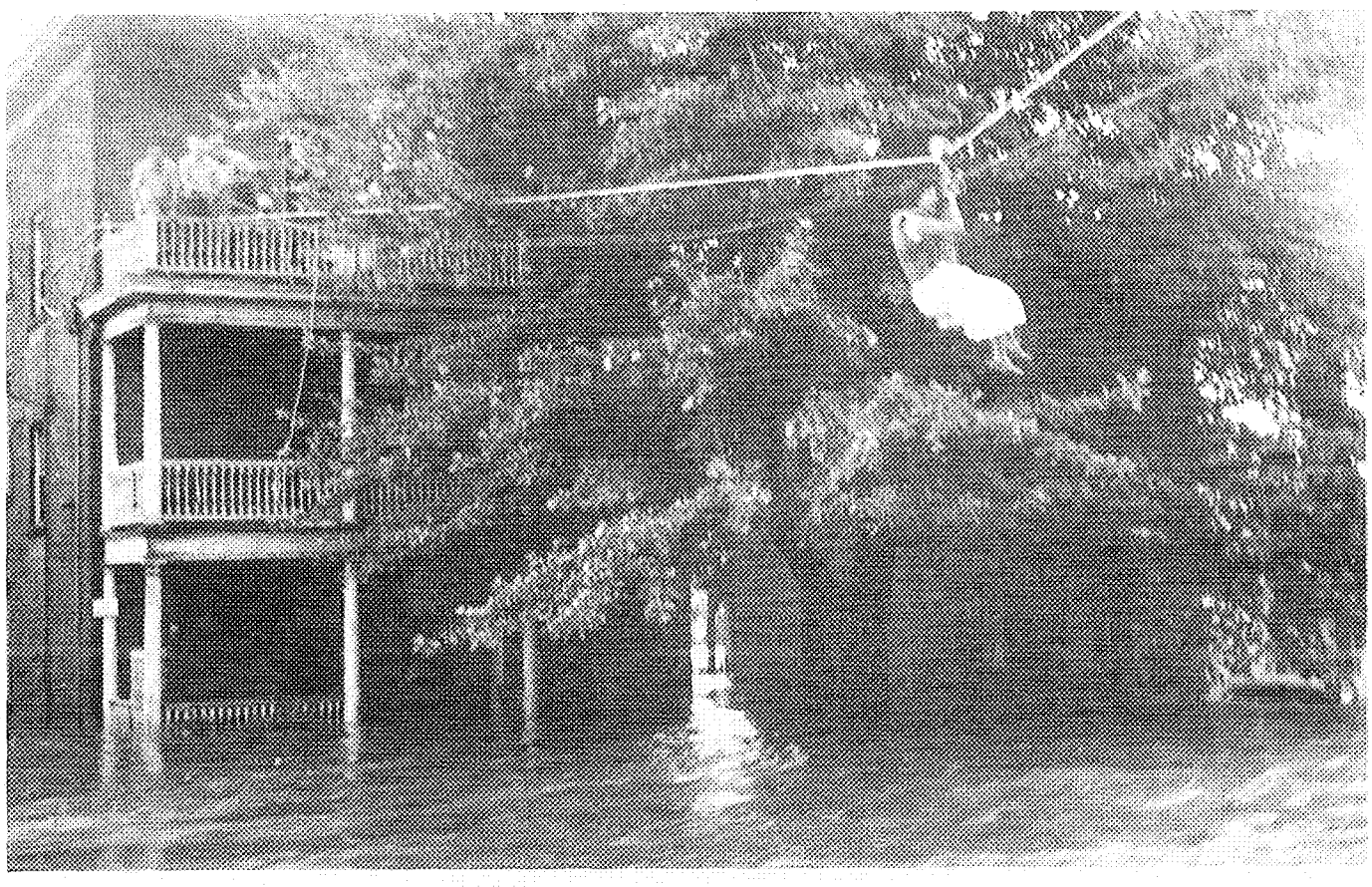
Waters from the Connecticut River surround the Hartford South Meadows Power Station (center) and cover much of Hartford, Connecticut, during the March 1936 flood. The spring floods of 1936 brought widespread disaster from Maine to Maryland and helped mold political and public opinion that culminated in the Flood Control Act of 1936, which recognized the proper involvement of the federal government in flood control. (Copyright 1936 The Hartford Courant.*)*

1938

The heavy rains of the September 1938 hurricane caused the Contoocook River to flood a section of East Jaffrey, New Hampshire. This storm, with its 121 m.p.h. gusts, took the lives of eight people in New England and caused damages of $48.6 million (about $823 million in today's dollars).

1954 *Hurricane Carol, which struck the New England coast in August 1954, caused damages estimated at $186 million ($762 million in today's dollars). The storm achieved its greatest fury in a band stretching from New London, Connecticut, to the Cape Cod Canal. All that remains of the Rhode Island Yacht Club (above) in the Pawtuxet Neck section of Warwick, Rhode Island, is a cradle of piles after the structure was destroyed by Carol's high winds and waves. (Copyright 1954* The Providence Journal Company.*)*

1955 *The Blackstone River overflows its banks and floods several businesses and homes in Pawtucket, Rhode Island, as a result of the heavy rains of Hurricane Diane in August 1955.*



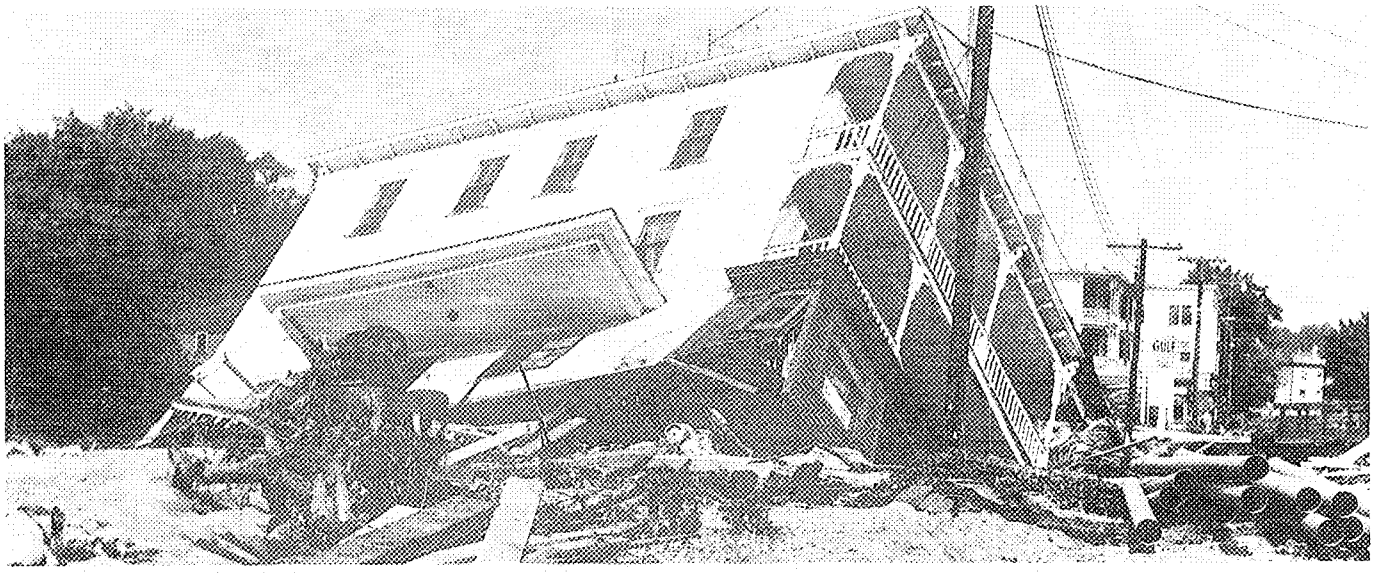
1955

No natural disaster in New England history compares with the devastation caused by the sudden and torrential rainfall which accompanied Hurricane Diane in August 1955. The disaster killed 90 people and caused almost $458 million (about $2.03 billion in today's dollars) in property damage throughout the six-state region. In Connecticut alone, Diane's floodwaters killed 47 people and caused damages totalling about $370 million (about $1.5 billion in today's dollars). The rains of Hurricane Diane fell on ground already saturated by the rains of Hurricane Connie one week earlier.

One of the communities that sustained heavy damage was Winsted, Connecticut. The waters of the Mad River overflowed its banks and roared through Main Street, uprooting foundations and flooding homes and businesses. When the floodwaters receded, the devastation became apparent (right). Main Street had become a pile of rubble, cluttered with debris ripped from its understructure.

The storm also forced hundreds of New Englanders to evacuate their homes, including a Connecticut woman (above) who was dramatically rescued from ravaging floodwaters. (Copyright 1955 The Hartford Courant.*)*

Only two months later, as Connecticut was getting back on its feet, another severe flood disrupted rehabilitation measures and caused losses estimated at $6.5 million. In response to these major floods, the Corps built several dams and local protection projects that, in a recurrence of the August 1955 flood today, would prevent damages of $1.09 billion



1955

As these photos from August 1955 demonstrate, floodwaters pose a powerful threat to property and lives. As the top photo shows, this Southbridge, Massachusetts, home was toppled when the floodwaters of the Quinebaug River weakened its foundation. Note the overturned automobile on the left; its only identifiable remains are its tires.

Floodwaters from the Blackstone River (above) roar through Webster Square in Worcester, Massachusetts.

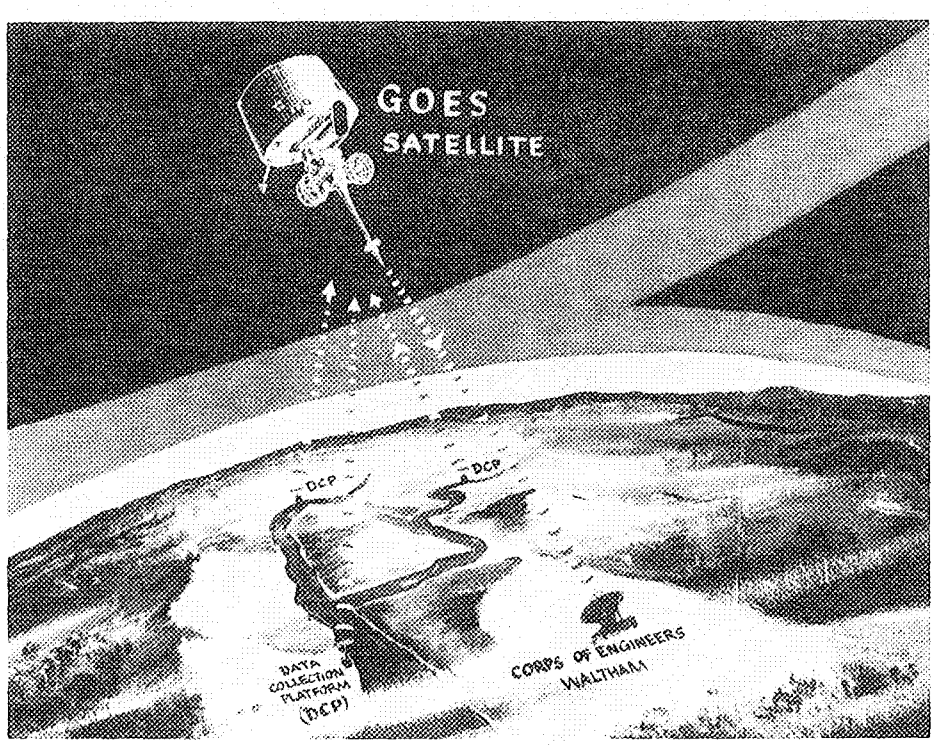
Reservoir Control Center

As a flood situation develops, considerable judgment and experience are required to efficiently manage Corps dams and reservoirs. Weather conditions, reservoir storage capacities and the flood levels of rivers are important factors when operating dams that maximize the protection of downstream communities and minimize flood damage. The nature of New England weather requires the region's dams and reservoirs be professionally managed by trained engineers and hydrologists. These skilled professionals, using sophisticated communications equipment, form an integral part of the Corps' flood control efforts known as the Reservoir Control Center (RCC).

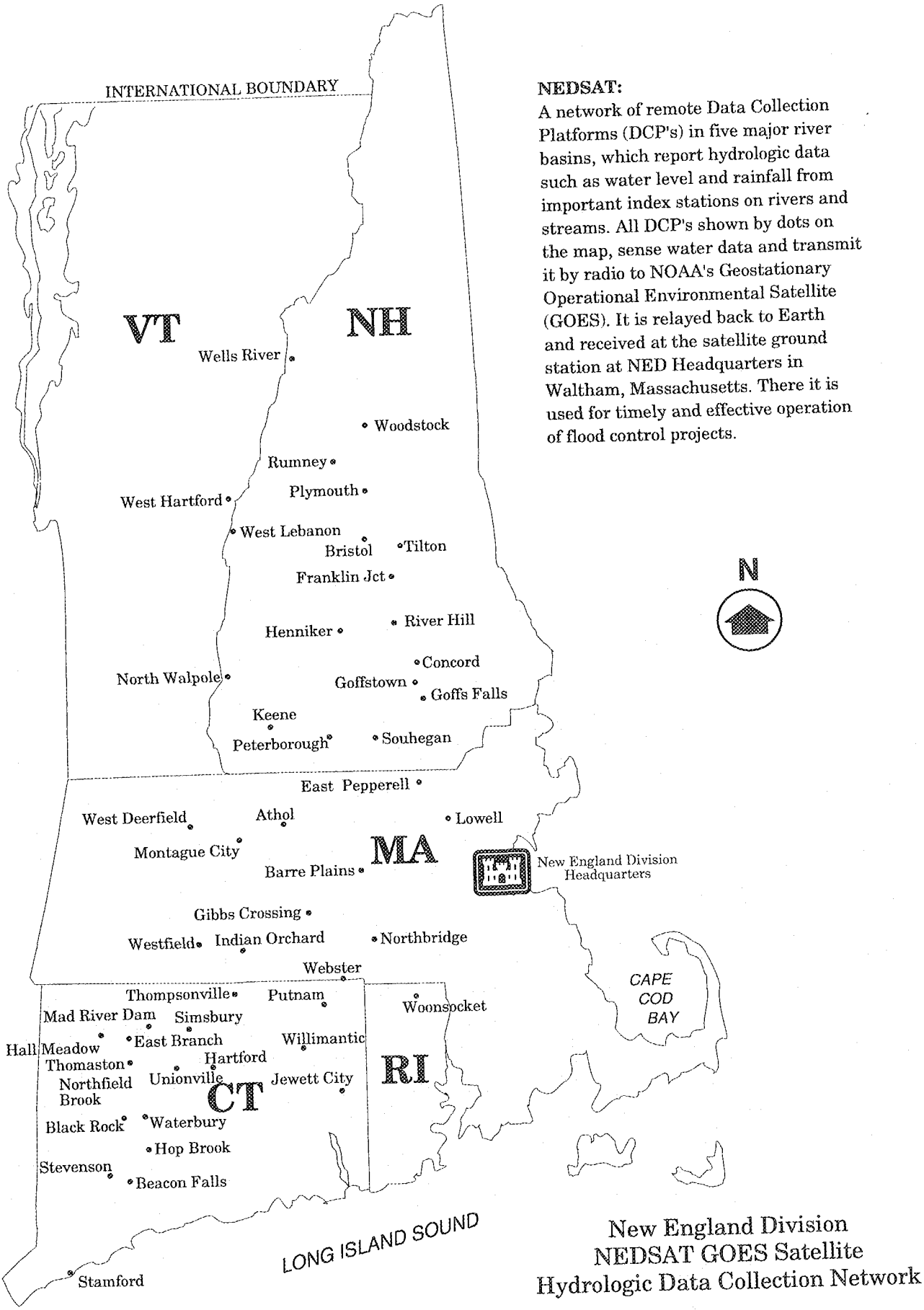
The RCC is located at the Corps' New England headquarters in Waltham, Massachusetts. From this site, Corps engineers closely monitor precipitation, river levels, and tidal levels in New England. The state-of-the-art communications equipment used by RCC personnel is complemented by the Geostationary Operational Environmental Satellite (GOES) System which serves as a communication link for the relay of hydrologic and meteorological data. Information from about 50 data collection platforms at key locations along rivers, streams and other bodies of water is relayed to a satellite, which transmits this data by radio signal to the RCC. Engineers then examine and analyze this hydrologic information for potential flood conditions and use this data to determine when to operate the flood control gates and when to release stored floodwaters from reservoirs once downstream flood conditions have receded. During flood emergency periods, additional information is obtained by telephone, teletype, and radio from field personnel and other agencies, such as the National Weather Service and the U.S. Geological Survey.

The Reservoir Control Center has helped minimize or prevent severe and damaging floods in many New England communities. The Corps is proud of its commitment to provide the public with improved flood protection through the professional management of its dams and hurricane protection barriers.

New England Division has been an innovative leader in the use of non-structural solutions for flooding problems. The Charles River Natural Valley Storage Project provides a novel approach to flood protection in parts of Boston and Cambridge by retaining flood flows on 8,100 acres of wetland areas acquired by the government at a cost of $9 million. In Warwick, Rhode Island, flood-prone properties were acquired, removed or modified to withstand high water events with the federal government underwriting 80% of the cost. In these times of environmental concern and building restrictions, non-structural flood protection projects have the potential to protect life and property with minimal adverse environmental impacts.



The GOES network, or the New England Division Satellite System (NEDSAT), plays a key role in helping the Corps reduce flood damage. About 50 data collection platforms (DCPs) are situated on various rivers and streams throughout five of the New England states (opposite page) where the Corps has dams and hurricane protection barriers. Hydrologic and meteorological data from these DCPs are relayed to a satellite stationed above the earth (right). The satellite then transmits this information by radio signal to the Corps' Reservoir Control Center in Waltham, Massachusetts. The data tell Corps' engineers when to open or close the floodgates of Corps' dams and hurricane protection barriers, thus limiting damage to communities downstream. The GOES system also provides the national weather maps displayed by local TV weathermen during their forecasts.



NEDSAT:
A network of remote Data Collection Platforms (DCP's) in five major river basins, which report hydrologic data such as water level and rainfall from important index stations on rivers and streams. All DCP's shown by dots on the map, sense water data and transmit it by radio to NOAA's Geostationary Operational Environmental Satellite (GOES). It is relayed back to Earth and received at the satellite ground station at NED Headquarters in Waltham, Massachusetts. There it is used for timely and effective operation of flood control projects.

New England Division
NEDSAT GOES Satellite
Hydrologic Data Collection Network

Shore and Hurricane Protection

The Corps' work in shore protection began in 1930, when Congress directed it to study ways to reduce erosion along U.S. seacoasts and the Great Lakes. Hurricane protection work was added to the erosion control mission in 1955, when Congress directed it to conduct investigations along the Atlantic and Gulf coasts to identify problem areas and determine the feasibility of protection.

While each situation the Corps studies involves different considerations, engineers always consider engineering feasibility and economic efficiency along with the environmental and social impacts. Federal participation in a shore protection project varies, depending on shore ownership, use and type and frequency of benefits. If there is no public use or benefit, the Corps will not recommend federal participation. Once the project is complete, non-federal interests assume responsibility for its operation and maintenance. The New England Division has completed 38 shore protection projects in the region.

One shore protection method popular in seaside communities is beach nourishment — the periodic replenishment of sand along the shoreline to replace that lost to storms and erosion. Authorized nourishment projects usually have a nourishment period of 50 years. In addition, Section 145 of the Water Resources Development Act of 1976 authorizes placement of beach quality sand from Corps dredging projects on nearby beaches. Under Section 933 of the Water Resources Development Act of 1986, local sponsors pay the federal government 50 percent of the additional costs of this placement of sand.

New England Division has been a pioneer in the construction of hurricane protection barriers. NED has constructed and operates hurricane barriers in Stamford, CT, and New Bedford, MA. Additionally NED has constructed barriers in Providence, RI; Pawcatuck, CT; and New London, CT. The local communities have assumed responsibility for their operation and maintenance.

This shore protection project at Oakland Beach in Warwick, Rhode Island, is a good example of how Corps' works help protect shores and restore beaches. Sand replenishment, which widened and restored the two beach areas on the far left and far right, slows the ocean's inland advance. The four groins maintain shore alignment by trapping and retaining sand. The stone revetment, in the center of the photograph between two groins, retards erosion.

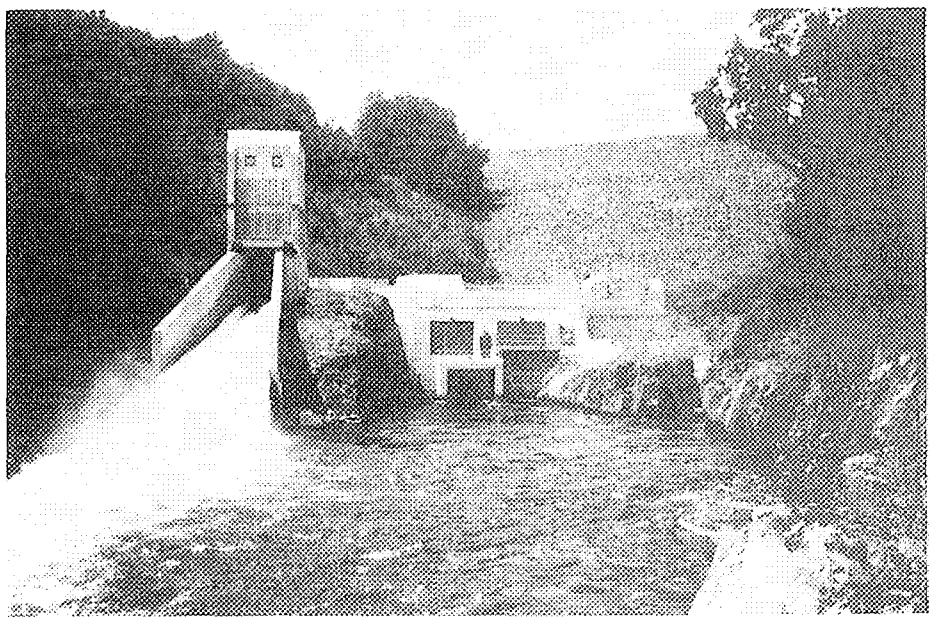
HYDROPOWER

The Corps has played a significant role in meeting the nation's electric power generation needs by building and operating hydropower plants in connection with its large multiple-purpose dams. The Corps' involvement in hydropower generation began with the Rivers and Harbors Acts of 1890 and 1899, which required the Secretary of War and the Corps of Engineers to approve the sites and plans for all dams and to issue permits for their construction. The Rivers and Harbors Act of 1909 directed the Corps to consider various water uses, including water power, when submitting preliminary reports on potential projects.

The Corps continues to consider the potential for hydroelectric power development during the planning process for all water resources projects involving dams and reservoirs. In most instances today, it is non-federal interests who develop hydropower facilities at Corps projects without federal assistance. The Corps, however, can plan, build and operate hydropower projects when it is impractical for non-federal interests to do so. Today, the more than 20,000 megawatts of capacity at Corps-operated power plants provide approximately 30 percent of the nation's hydroelectric power, or three percent of its total electric energy supply.

In New England, the Corps does not operate any hydroelectric power facilities, but there are eight hydroelectric power plants at Corps flood control dams which were constructed and are owned and operated by nonfederal interests. These plants are located in:

- *North Hartland, Vermont*, about 500 feet downstream of the North Hartland Lake Dam. This facility produces 4 megawatts of power. All power generated at this plant is used by the Vermont Electric Cooperative or is sold to other utilities.
- *Quechee, Vermont*, 2.5 miles upstream of the North Hartland Lake Dam and within the reservoir area. Built on Corps land, this plant produces 1.8 megawatts. Power is sold to the Central Vermont Public Service Corporation.
- *Waterbury, Vermont*, at the base of the dam at Waterbury Reservoir. This facility generates approximately 5.5 megawatts of power, which is used by the Green Mountain Power Corporation.
- *Montpelier, Vermont*, approximately 200 feet downstream of the dam at Wrightsville Reservoir. The plant has the capacity to produce 1.2 megawatts of power, which is used by the Washington Electric Cooperative.
- *Franklin, New Hampshire*, on Salmon Brook. Built on Corps land within the Franklin Falls reservoir, this facility produces 0.2 megawatts of power. Power is sold to the Public Service Company of New Hampshire.
- *Bristol, New Hampshire*, on the Newfound River. This plant produces 1.5 megawatts and lies on private property but within the Franklin Falls reservoir area. Power is sold to the Public Service Company of New Hampshire.
- *Peterborough, New Hampshire*, on Verney Mills Dam at Edward MacDowell Lake. This facility began producing power in 1990. The power is sold to the Public Service Company of New Hampshire.



Although the Corps does not presently operate any hydroelectric power plants in New England, there are eight hydropower plants located at Corps flood control projects in the region that are owned and operated by nonfederal interests. The North Hartland hydropower facility in North Hartland, Vermont, located 500 feet downstream of the Corps-operated North Hartland Lake Dam, is one such facility.

- *Colebrook, Connecticut,* where six turbine generators are lowered by crane to a position in front of the intake conduits of Colebrook River Lake. Operated by the Metropolitan District Commission of Hartford, the 7.5 megawatts of power generated annually are sold to Connecticut Light & Power Company.
- *Hopkinton, New Hampshire, on the Contoocook River.* The Corps' Hopkinton Lake provides river flows up to 900 cfs or inflow if less through a forebay conduit to Consolidate Hydro Operations Inc's Hoague-Sprague Project. This facility produces 3.6 million kilowatt hours of power. The power is sold to Public Service Company of New Hampshire.

New England division is evaluating a prototype design for installation of a vertical axis hydro turbine (VAHT) which would harness the energies of the continual tidal currents at the Cape Cod Canal. If installed, the energy generated would offset the current electrical bill. This prototype has widespread repercussions as it does not require the costly superstructure of conventional submerged hydro turbines.

Water Supply

Corps involvement in water supply dates back to 1853, when it began building the Washington Aqueduct, which provides water to the nation's capital city and some of its suburbs to this day.

Elsewhere in the nation, the Water Supply Act of 1958 authorized the Corps to provide additional storage in its reservoirs for municipal and industrial water supply at the request of local interests, who must agree to pay the cost. The Corps also supplies water for irrigation, under the Flood Control Act of 1944. This act provided that the Secretary of War, upon the recommendation of the Secretary of the Interior, could allow use of Corps reservoirs for irrigation, provided that users agree to repay the government for the water.

Environmental Quality

The Corps carries out the Civil Works Programs in consistency with many environmental laws, executive orders and regulations. Perhaps primary among these is the National Environmental Policy Act (NEPA) of 1969. This law requires federal agencies to study and consider the environmental impacts of their proposed actions. Consideration of the environmental impact of a Corps project begins in the early stages, and continues through design, construction and operation of the project. The Corps must also comply with these environmental laws and regulations in conducting its regulatory programs.

NEPA procedures ensure that public officials and private citizens may obtain and provide environmental information before federal agencies make decisions concerning the environment. In selecting alternative project designs, the Corps strives to choose options with minimum environmental impact.

The Water Resources Act of 1986 authorizes the Corps to propose modifications of its existing projects —many of them built before current environmental requirements were in effect for environmental improvement. Proposed modifications under this authority range from use of dredged material to create nesting sites for waterfowl to modification of water control structures to improve downstream water quality for fish.

In recent years the Corps of Engineers has planned and recommended environmental restoration actions at federal projects to restore environmental conditions.

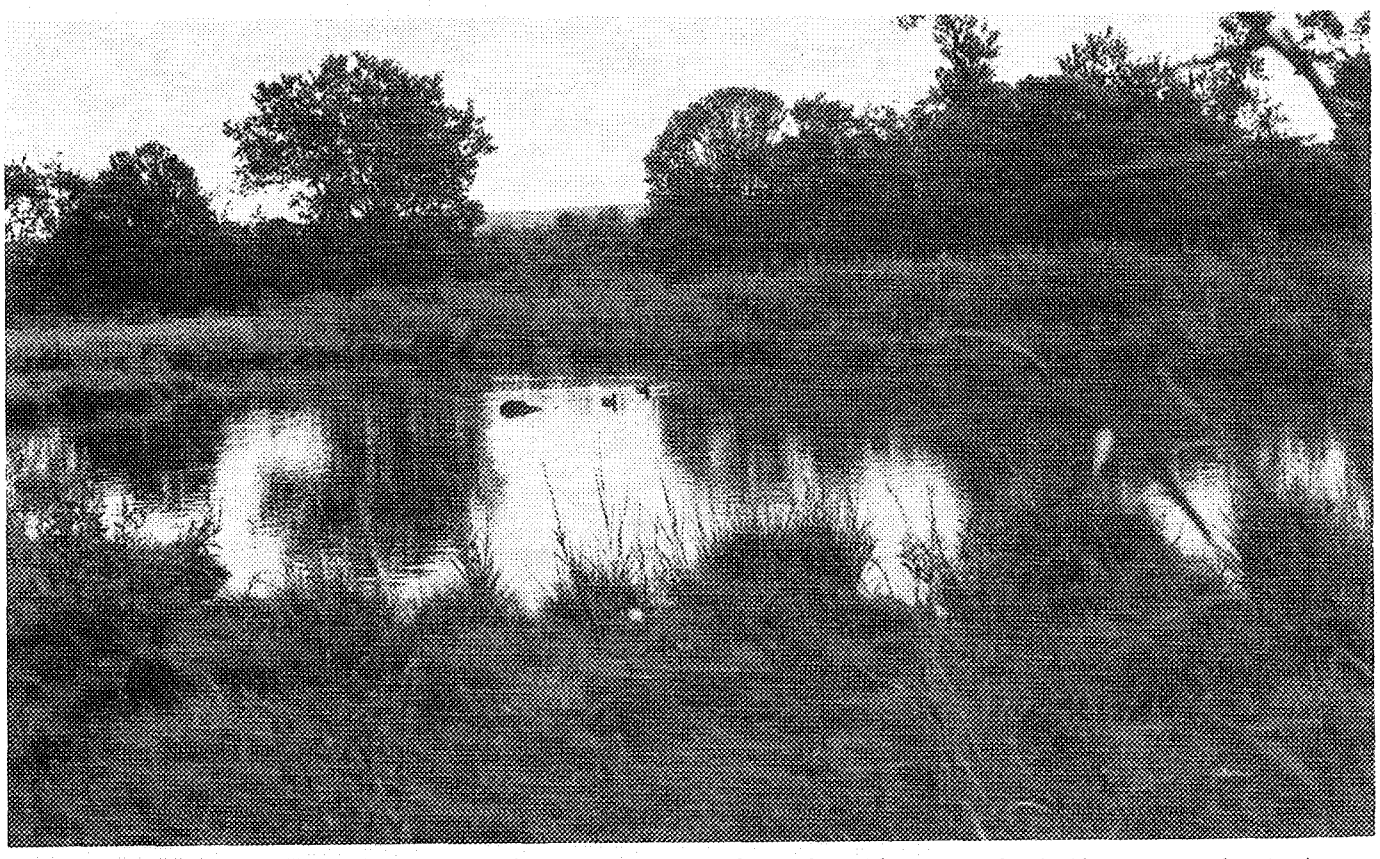
Regulatory Programs

The Corps of Engineers regulates construction and other work in navigable waterways under Section 10 of the Rivers and Harbors Act of 1899, and has authority over the discharge of dredged or fill material into the "waters of the United States" (a term which includes wetlands and all other aquatic areas) under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500, the "Clean Water Act"). Under these laws, those who seek to carry out such work must first receive a permit from the Corps.

The "Section 404" program is the principal way by which the federal government protects wetlands and other aquatic environments. The program's goal is to ensure protection of the aquatic environment while allowing for necessary economic development.

The permit evaluation process includes a public notice with a public comment period. Application for complex projects may also require a public hearing before the Corps makes a permit decision. In its evaluation of applications, the Corps is required by law to consider all factors involving the public interest. These may include economics, environmental concerns, historical values, fish and wildlife, aesthetics, flood damage prevention, land use classifications, navigation, recreation, water supply, water quality, energy needs, food production and the general welfare of the public.

The Corps of Engineers has issued a number of nationwide general permits mostly for minor activities which have little or no environmental impact. Offices have also issued regional permits for certain types of minor work in specific areas and State Program General Permits in states with comprehensive wetland protection programs. These permits allow applicants to do work for which a state permit has been issued by reducing delays and paperwork for applicants and allowing the Corps to devote its resources to the most significant cases while maintaining the environmental safeguards of the Clean Water Act.



Baker Cove in Groton, Connecticut, like many wetlands, supports numerous plant and animal species. Before building a proposed project in a given area, the Corps looks closely at the effects such a project may have on the environment and surrounding wetlands. The Corps considers all options, including those that preclude development, in finding a solution to a water resources problem.

RECREATION

The Flood Control Act of 1944, the Federal Water Project Recreation Act of 1965, and language in specific project authorization acts authorize the Corps to construct, maintain, and operate public park and recreational facilities at its projects, and to permit others to build, maintain, and operate such facilities. The water areas of Corps projects are open to public use for boating, fishing, and other recreational purposes.

The Corps of Engineers today is one of the federal government's largest providers of outdoor recreational opportunities, operating more than 2,000 sites at its lakes and other water resource projects. More than 600 million visits per year are recorded at these sites. State and local park authorities and private interests operate nearly 2,000 other areas at Corps projects.

There are many recreational opportunities available at the 35 dams and reservoirs built by the Corps' New England Division such as snowmobiling at Blackwater Dam in Webster, New Hampshire (right); and fly fishing at Townshend Lake Dam in Townshend, Vermont (below).

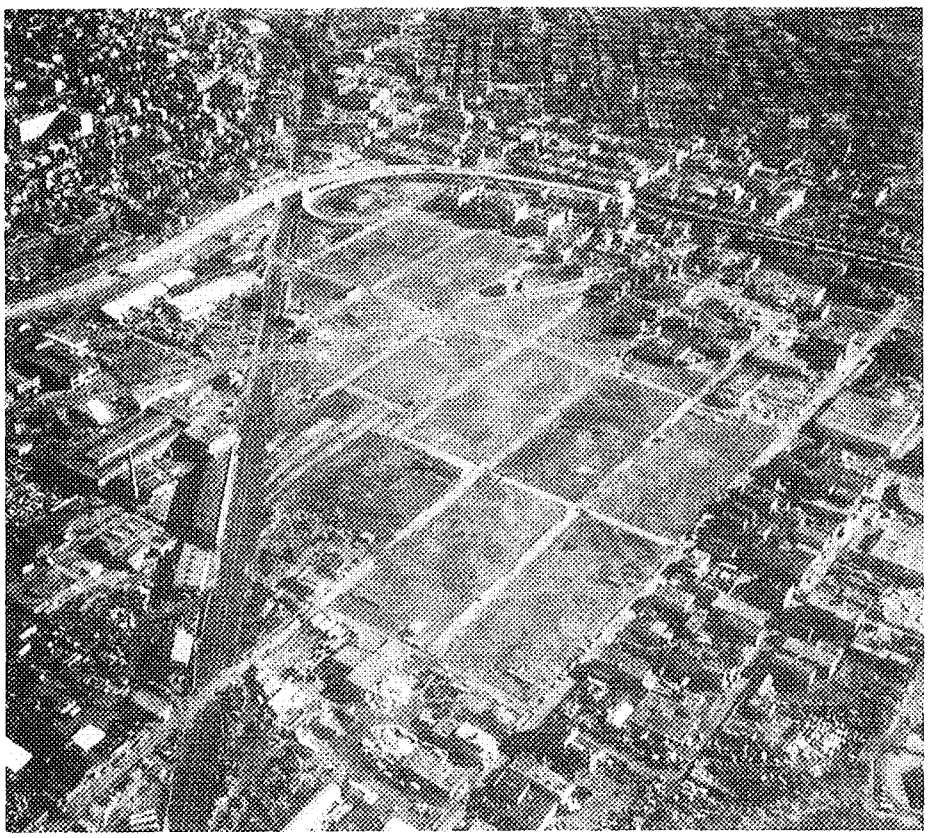
Emergency Response and Recovery

The Corps provides emergency response to natural disasters under Public Law 84-99 which covers flood control and coastal emergencies. It also provides emergency support to other agencies, particularly the Federal Emergency Management Agency (FEMA), under Public Law 93-288 (the Stafford Act), as amended.

Under PL 84-99 the Chief of Engineers, acting for the Secretary of the Army, is authorized to carry out disaster preparedness work, advance measures, emergency operations (e.g., flood fighting, rescue and emergency relief activities), rehabilitation of flood control works threatened or destroyed by flood, and protection or repair of federally authorized shore protection works threatened or damaged by coastal storms.This act also authorizes the Corps to provide emergency supplies of clean water in cases of drought or contaminated water supply. After the flooding has passed, the Corps provides temporary construction and repairs to essential public utilities and facilities and emergency access for a 10-day period, at the request of the governor.

Under the Stafford Act and the Federal Disaster Response Plan, the Corps of Engineers has a standing mission assignment to provide public works and engineering support in response to a major disaster or catastrophic earthquake. Under this plan, the Corps will work directly with the state in providing temporary repair and construction of roads, bridges, and utilities, temporary shelter, debris removal and demolition, water supply, etc.

The Corps is one of the federal agencies tasked by FEMA to provide engineering, design, construction and contract management in support of recovery operations.



The Corps provided disaster relief assistance to residents of Chelsea, Massachusetts, when fire destroyed 18 city blocks in October 1973.

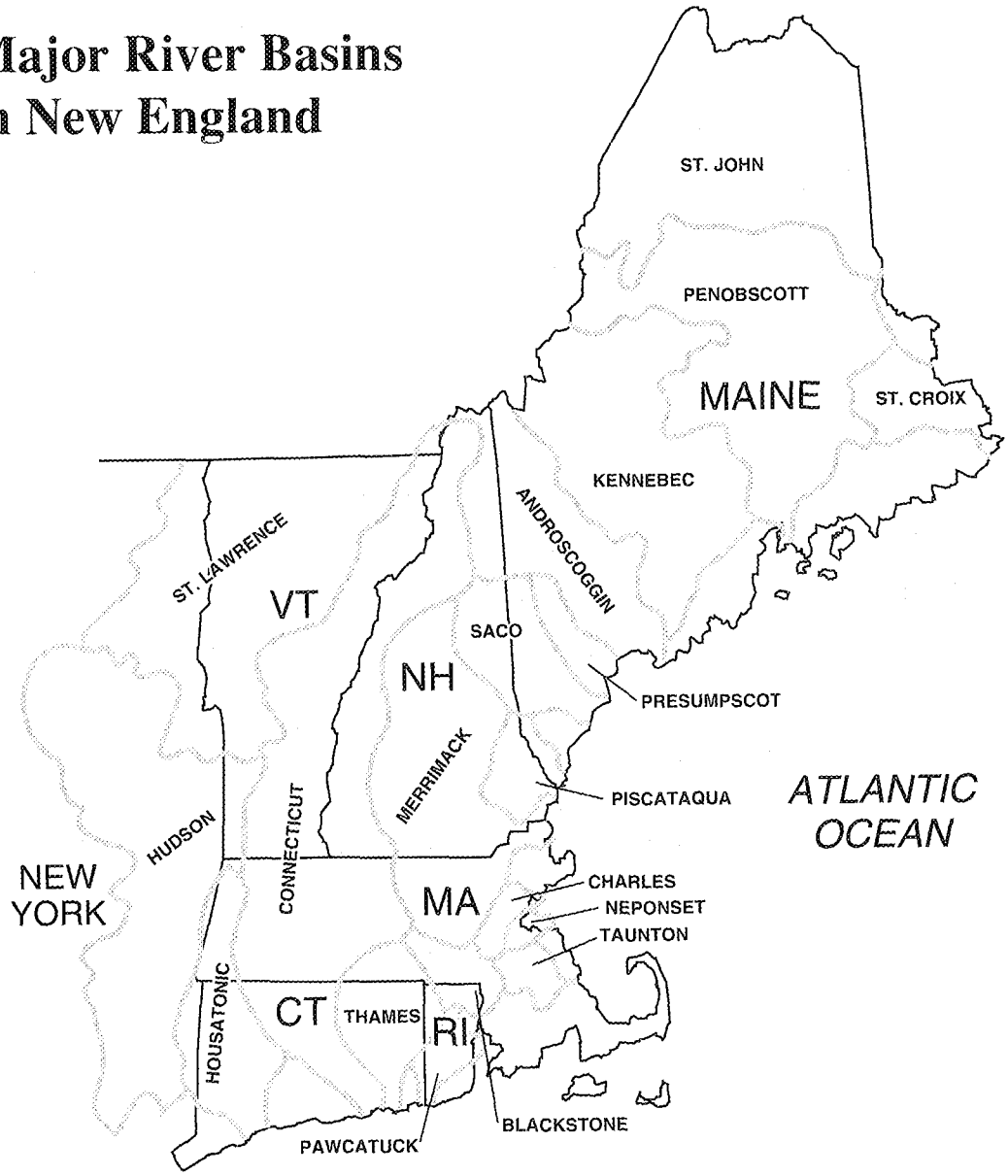
DESCRIPTION OF PROJECTS

River Basins

Flooding may be caused by a combination of many factors related to the underlying river basin. Corps' Flood Damage Reduction projects, such as dams and Local Protection Projects, are designed and constructed as part of an overall plan to limit flooding in a particular river basin.

There are 19 principal river basins that lie entirely or partially in New England. Of this number, eight lie in Maine - the Saint John, Penobscot, Saint Croix, Kennebec, Androscoggin, Presumpscot, Saco, and Piscataqua. Three of these basins, the Saint John, Penobscot, and Kennebec, have Corps' Flood Damage Reduction projects within their drainage areas.

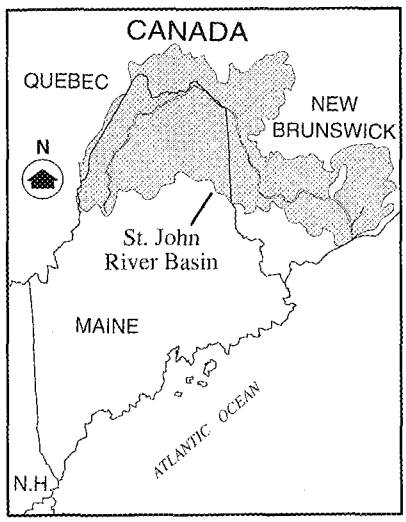
The following pages show where the eight river basins lie in the state. Maps of the Saint John, Penobscot, and Kennebec River Basins show the location of the Corps' Flood Damage Reduction project in each.

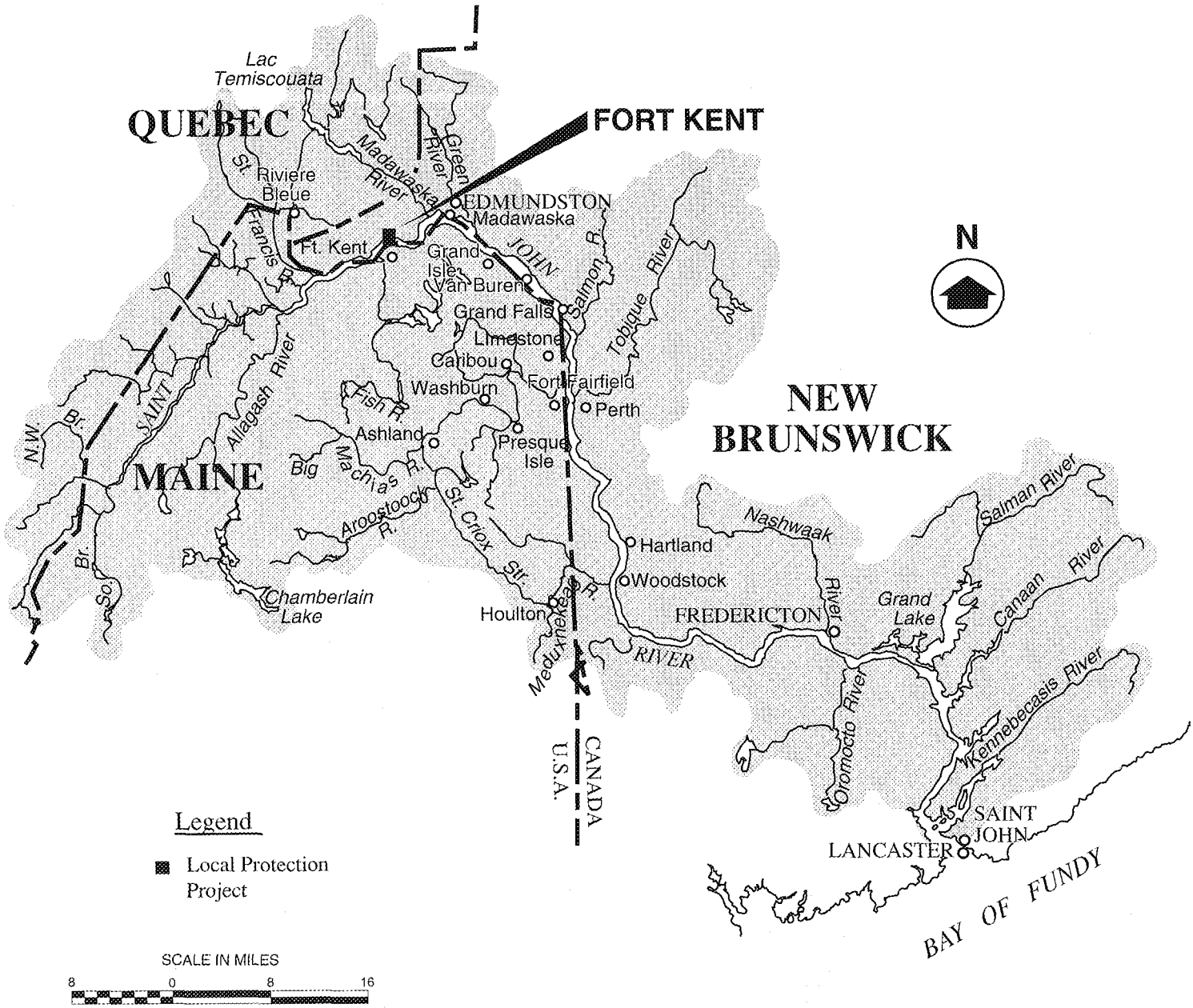


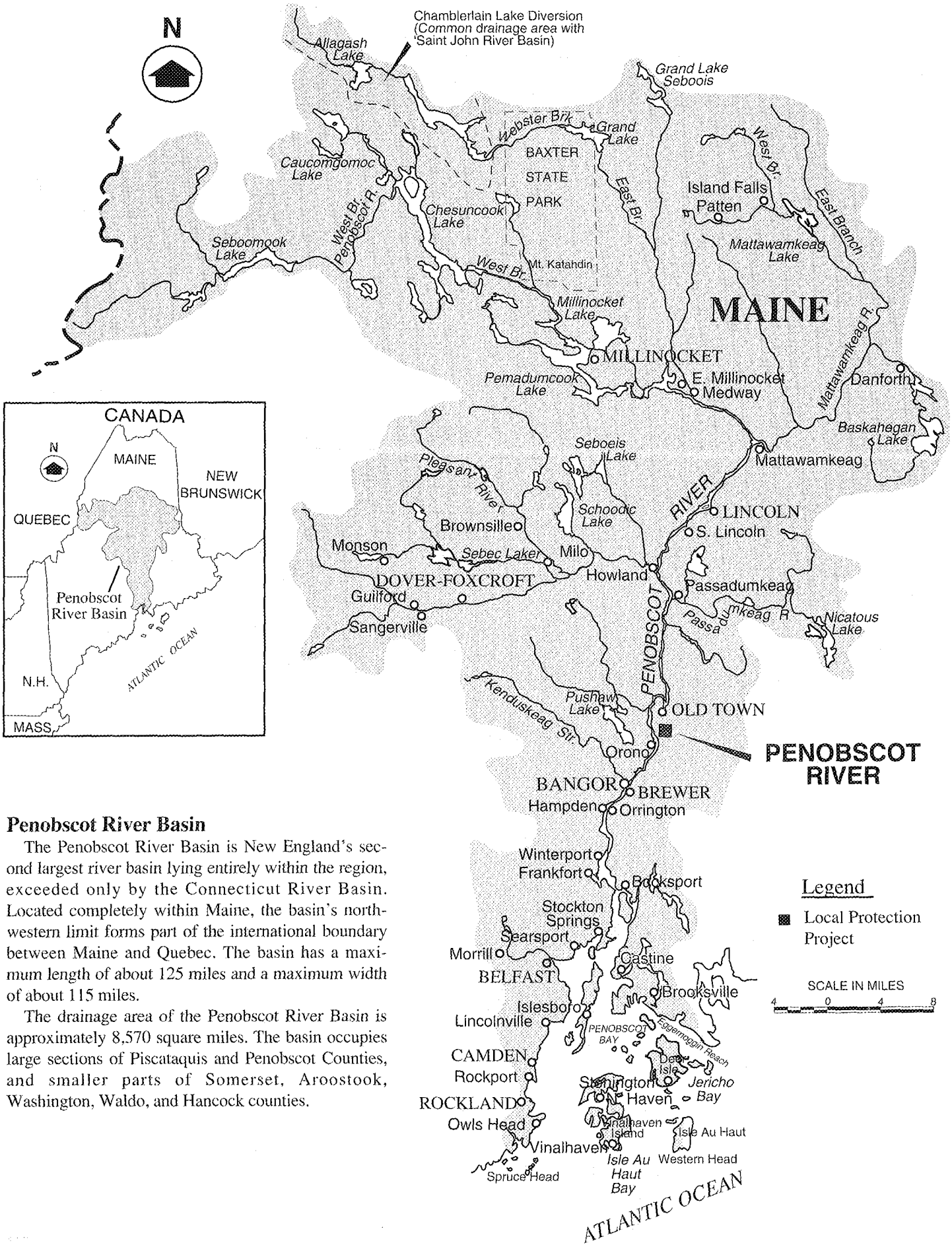
Saint John River Basin

The Saint John River Basin is one of the largest basins on the Atlantic seaboard. It has a drainage area of 21,360 square miles, of which approximately 14,000 (66 percent) square miles lie in the Canadian provinces of New Brunswick and Quebec, and 7,360 square miles (34 percent) in northern Maine. The basin has a maximum length of approximately 121 miles and a maximum width of approximately 253 miles. For about 100 miles, the Saint John River forms the United States-Canada boundary.

The Saint John River Basin occupies most of Aroostook County and small sections of Somerset, Piscataquis, and Penobscot counties.



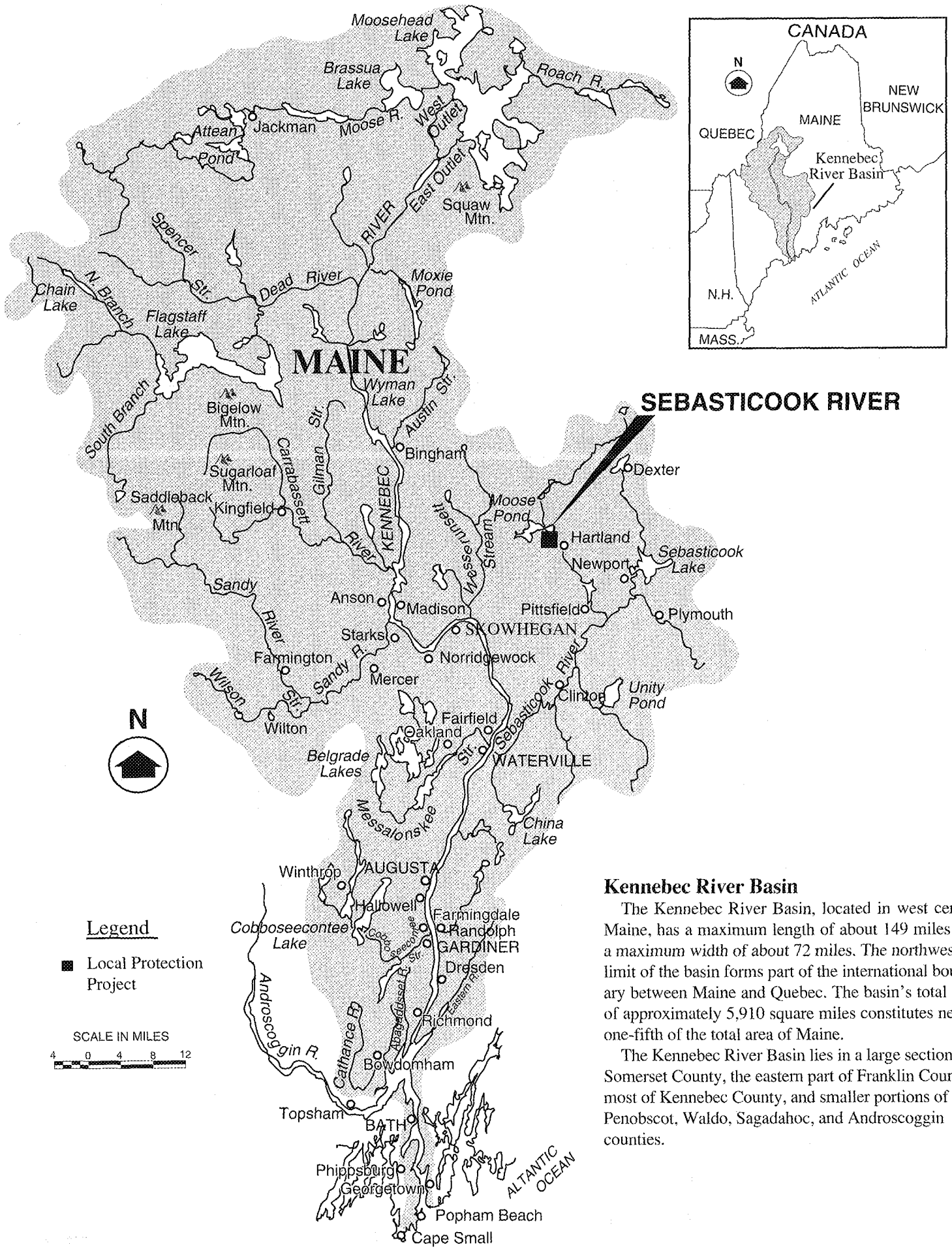




Penobscot River Basin

The Penobscot River Basin is New England's second largest river basin lying entirely within the region, exceeded only by the Connecticut River Basin. Located completely within Maine, the basin's northwestern limit forms part of the international boundary between Maine and Quebec. The basin has a maximum length of about 125 miles and a maximum width of about 115 miles.

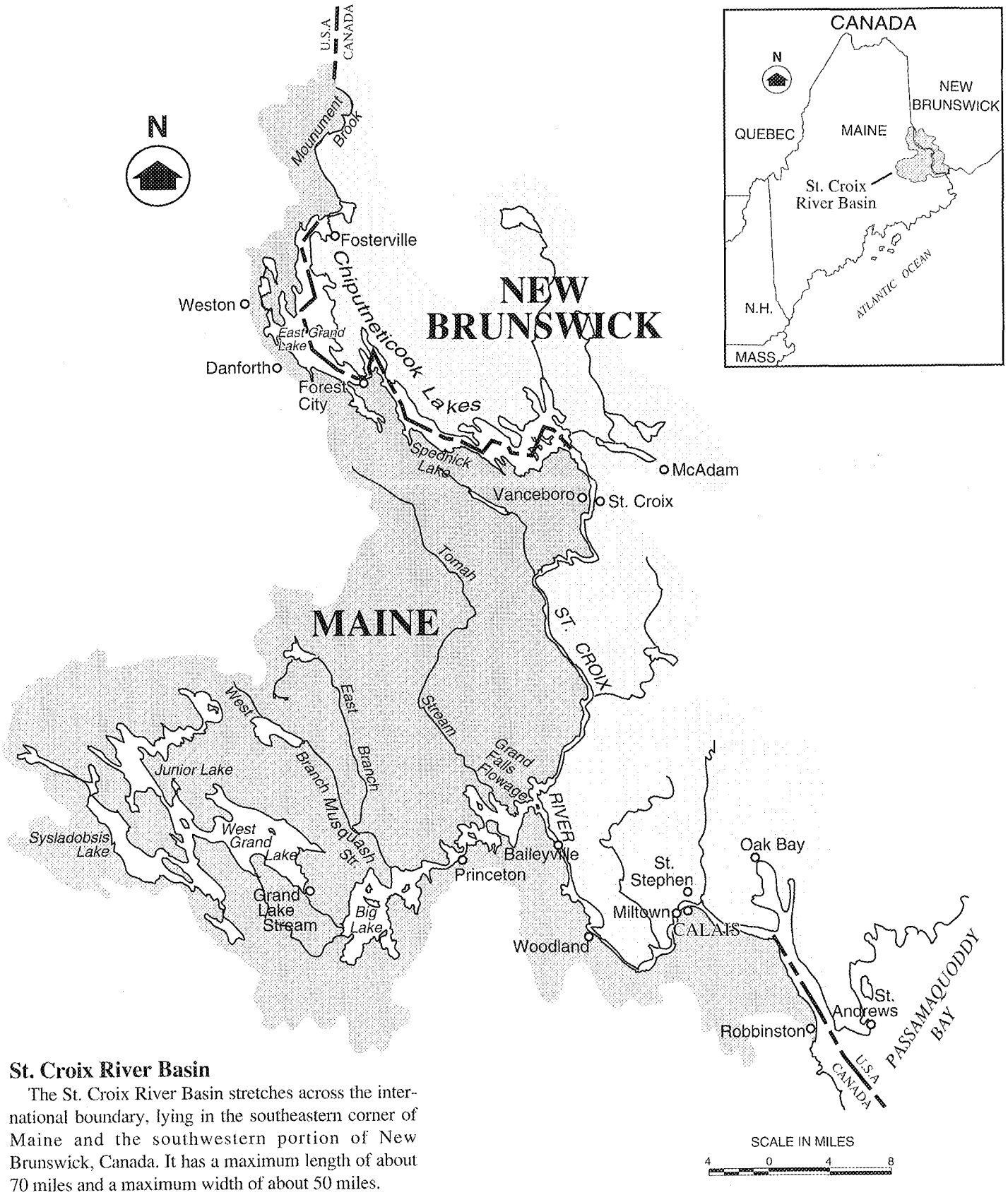
The drainage area of the Penobscot River Basin is approximately 8,570 square miles. The basin occupies large sections of Piscataquis and Penobscot Counties, and smaller parts of Somerset, Aroostook, Washington, Waldo, and Hancock counties.



Kennebec River Basin

The Kennebec River Basin, located in west central Maine, has a maximum length of about 149 miles and a maximum width of about 72 miles. The northwestern limit of the basin forms part of the international boundary between Maine and Quebec. The basin's total area of approximately 5,910 square miles constitutes nearly one-fifth of the total area of Maine.

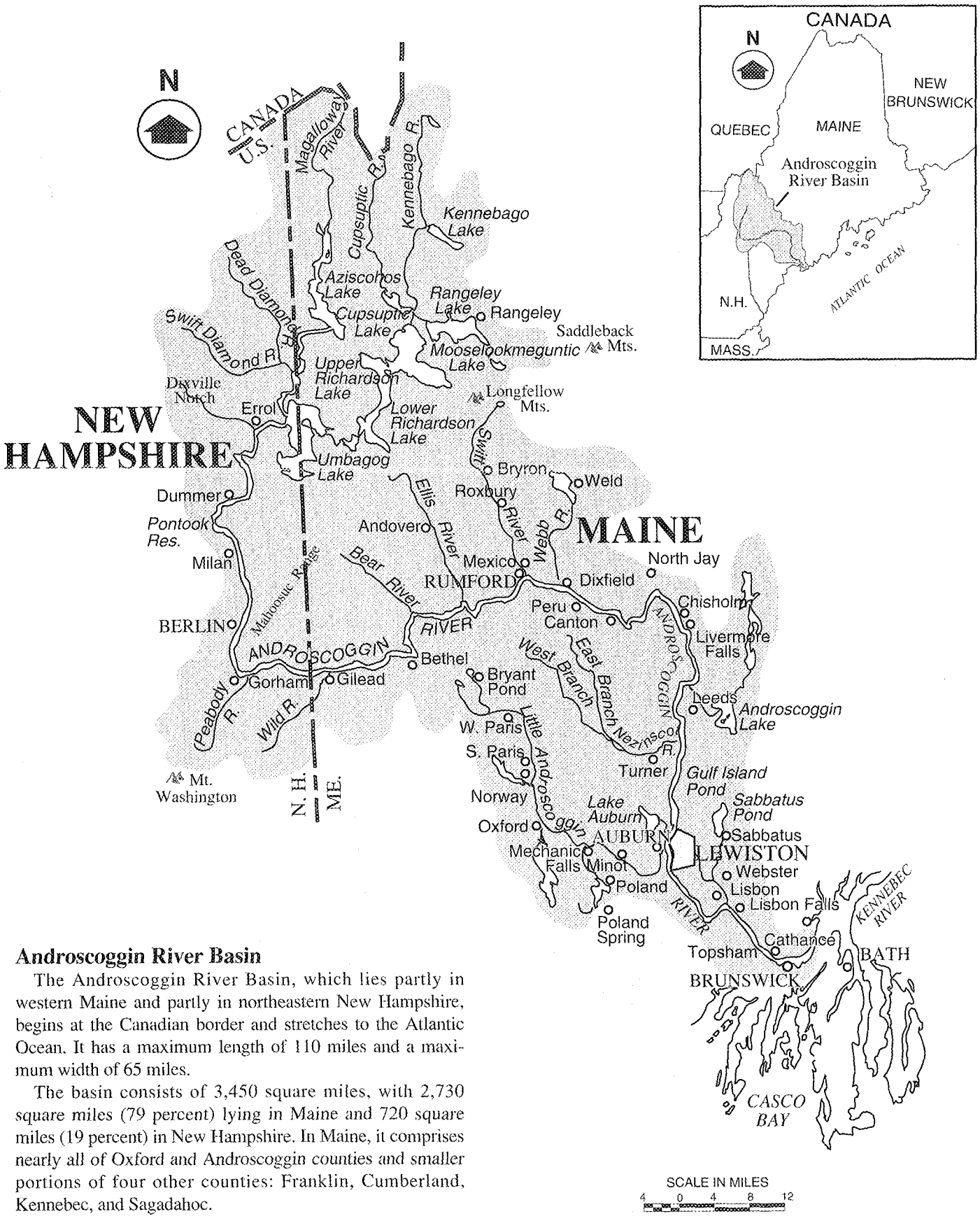
The Kennebec River Basin lies in a large section of Somerset County, the eastern part of Franklin County, most of Kennebec County, and smaller portions of Penobscot, Waldo, Sagadahoc, and Androscoggin counties.



St. Croix River Basin

The St. Croix River Basin stretches across the international boundary, lying in the southeastern corner of Maine and the southwestern portion of New Brunswick, Canada. It has a maximum length of about 70 miles and a maximum width of about 50 miles.

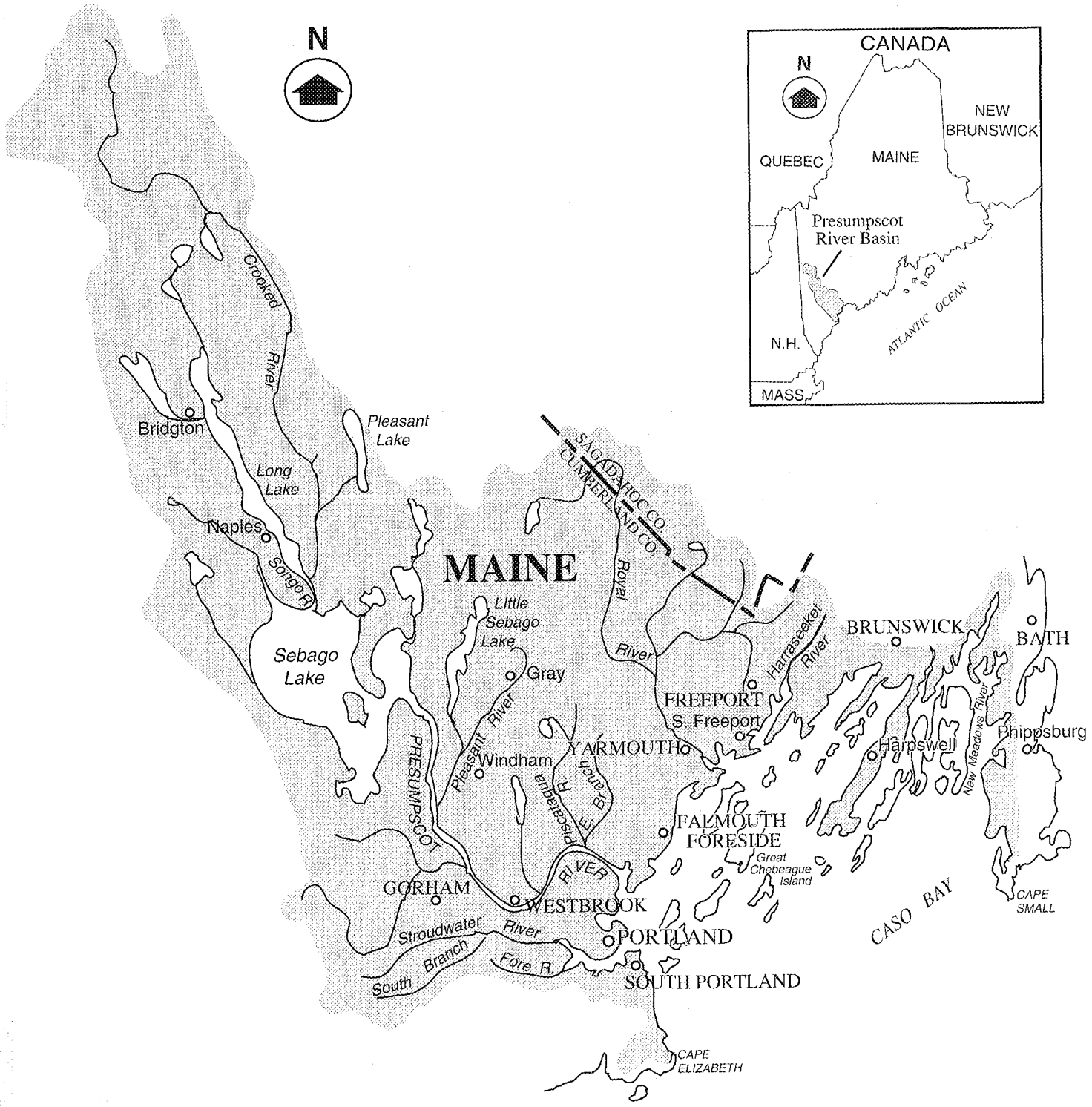
Of its total area of 1,635 square miles, 1,010 square miles (62 percent) lie in Maine, and 625 square miles (38 percent) lie in New Brunswick. In Maine, most of the basin lies in Washington County, with smaller sections lying in Aroostook, Penobscot, and Hancock counties.



Androscoggin River Basin

The Androscoggin River Basin, which lies partly in western Maine and partly in northeastern New Hampshire, begins at the Canadian border and stretches to the Atlantic Ocean. It has a maximum length of 110 miles and a maximum width of 65 miles.

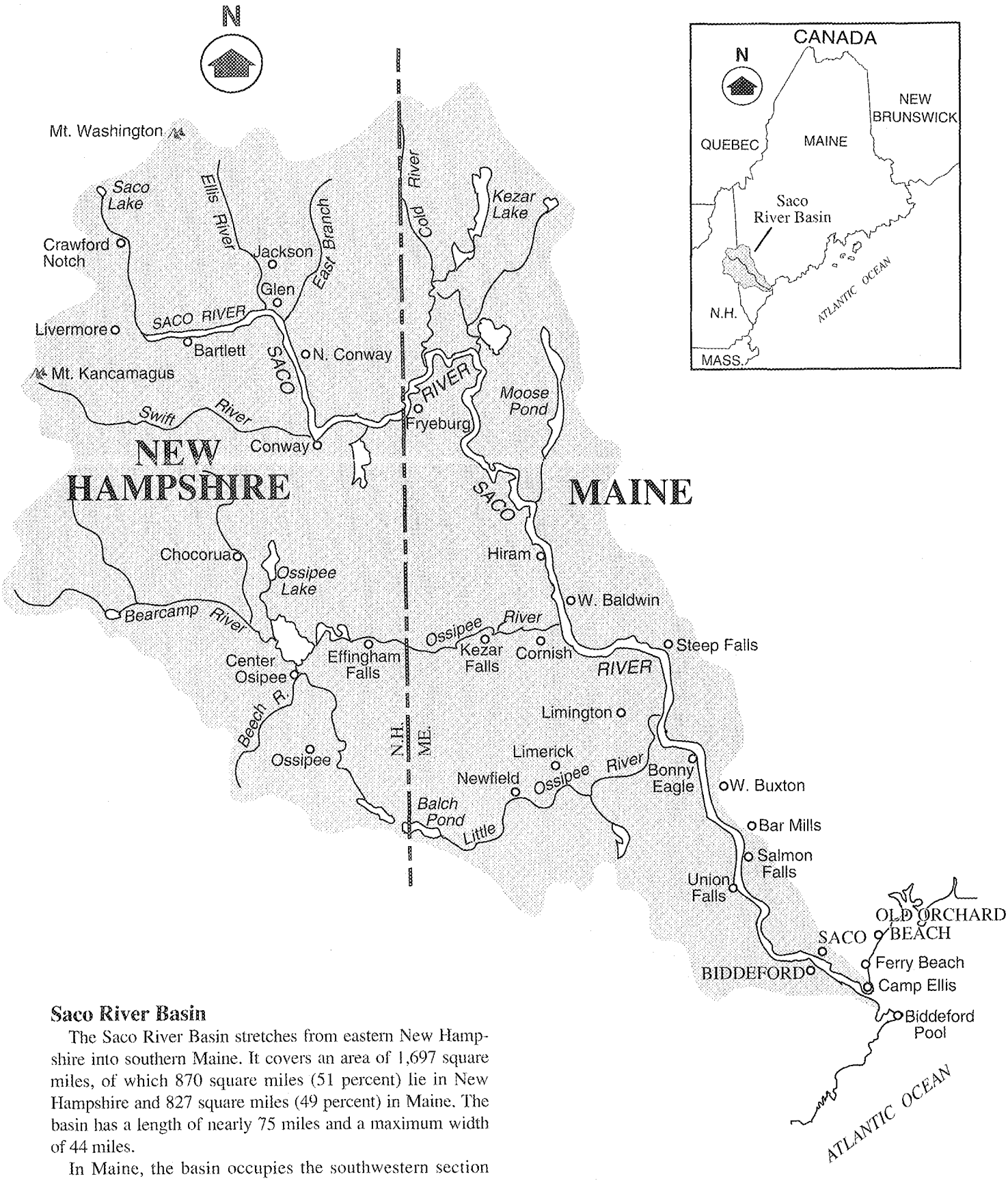
The basin consists of 3,450 square miles, with 2,730 square miles (79 percent) lying in Maine and 720 square miles (19 percent) in New Hampshire. In Maine, it comprises nearly all of Oxford and Androscoggin counties and smaller portions of four other counties: Franklin, Cumberland, Kennebec, and Sagadahoc.



Presumpscot River Basin

Located in southwestern Maine, the Presumpscot River Basin lies entirely within the state and has a total area of 920 square miles. The basin's maximum length is 63 miles and maximum width is 41 miles.

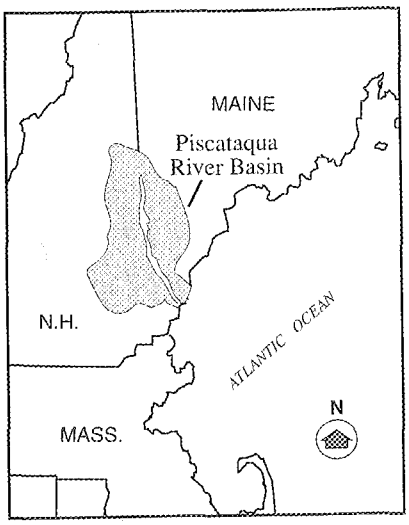
The basin occupies most of Cumberland County and minor portions of Oxford, Androscoggin, and Sagadahoc counties.



Saco River Basin

The Saco River Basin stretches from eastern New Hampshire into southern Maine. It covers an area of 1,697 square miles, of which 870 square miles (51 percent) lie in New Hampshire and 827 square miles (49 percent) in Maine. The basin has a length of nearly 75 miles and a maximum width of 44 miles.

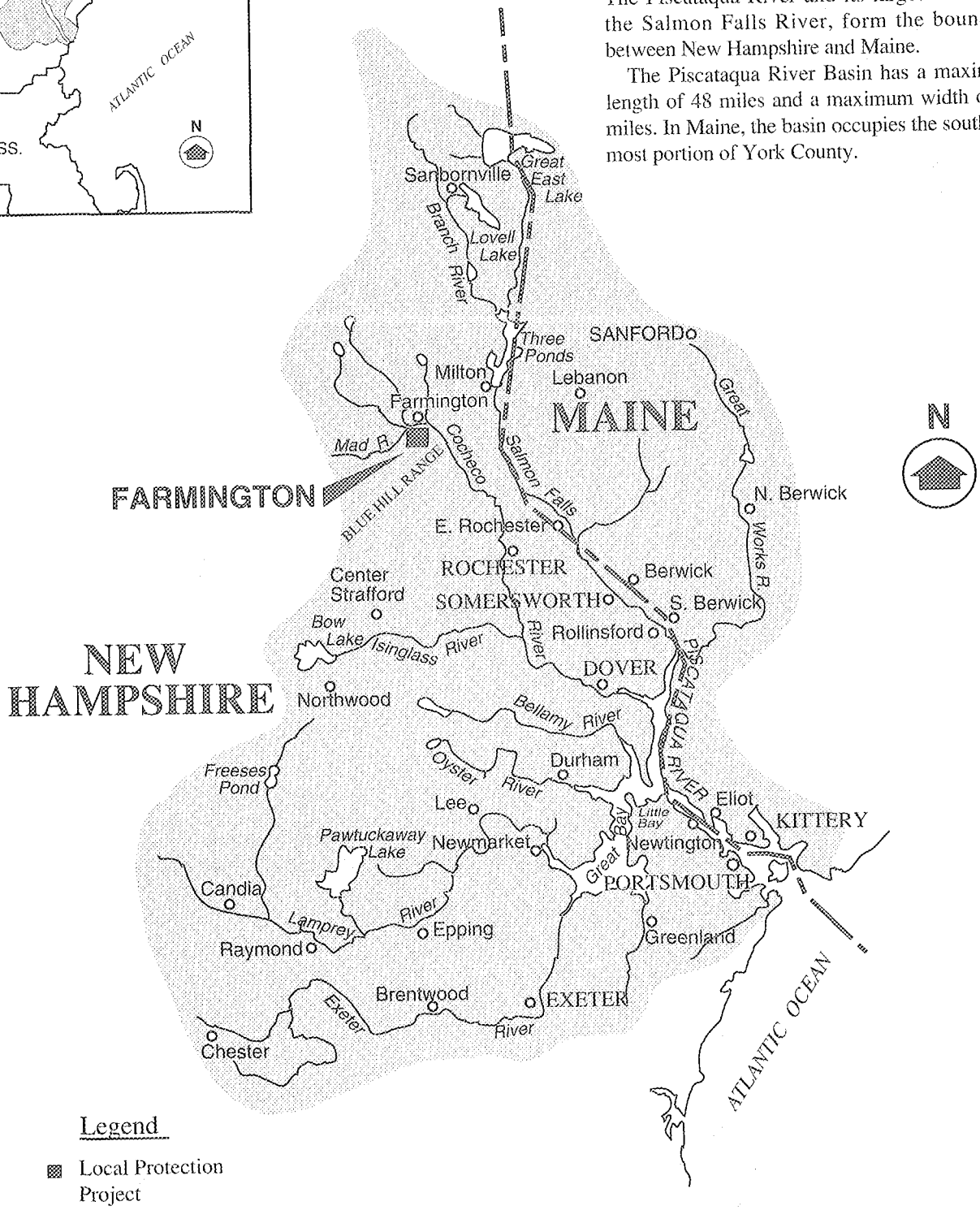
In Maine, the basin occupies the southwestern section of Oxford County, most of the northern third of York County, and minor areas of western Cumberland County.



Piscataqua River Basin

Although it lies mostly in southeastern New Hampshire, a portion of the Piscataqua River Basin lies at the southern tip of Maine. Of the basin's total area of 1,022 square miles, 776 square miles (76 percent) lie in New Hampshire and 246 square miles (24 percent) lie in Maine. The Piscataqua River and its largest tributary, the Salmon Falls River, form the boundary between New Hampshire and Maine.

The Piscataqua River Basin has a maximum length of 48 miles and a maximum width of 35 miles. In Maine, the basin occupies the southernmost portion of York County.

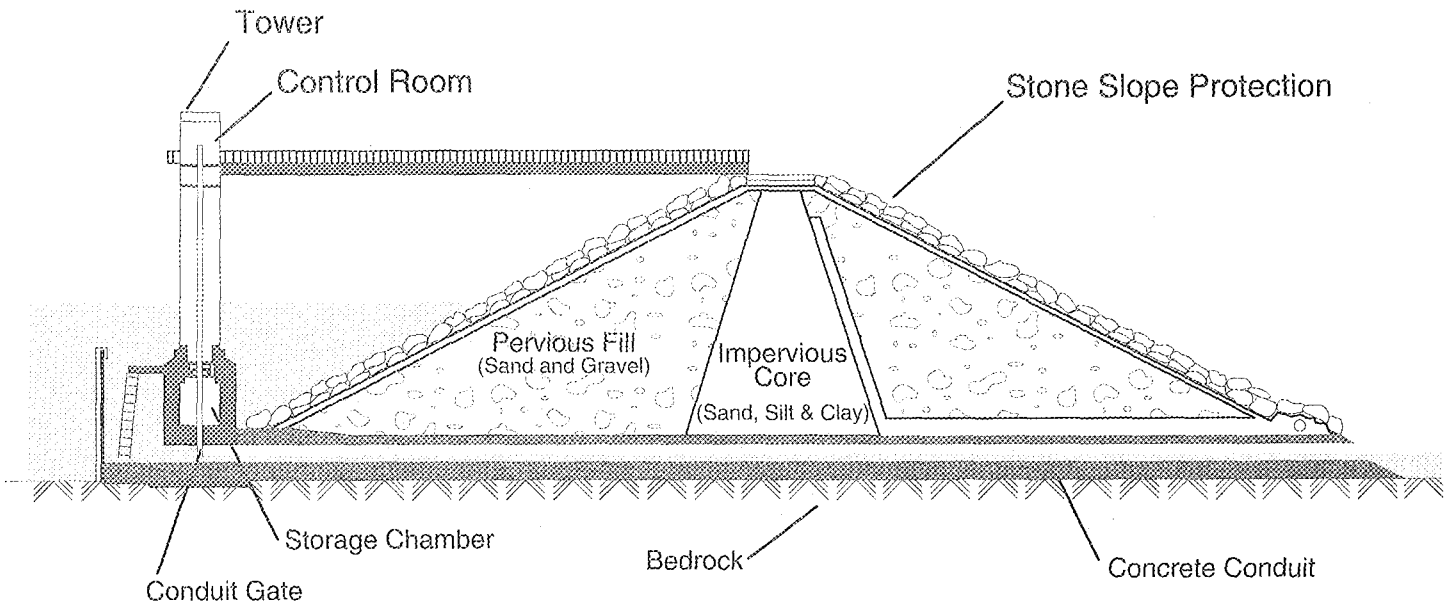


Flood Damage Reduction

The U.S. Army Corps of Engineers has constructed four flood damage reduction projects that significantly reduce flooding damages in Maine. These projects, commonly referred to as local protection projects because they provide flood protection to specific communities rather than wide areas of a state, cost a combined $4.25 million to construct. Local protection projects in Maine are operated and maintained by the respective municipalities, except for the Penobscot River project in Old Town, which is operated by the Penobscot Tribe.

The following pages give a brief history and description of the flood damage reduction projects constructed by the Corps in Maine.

Note: Figures for damages prevented by each flood control project may be found on the insert at the front of the book.



TYPICAL CROSS SECTION OF AN EARTHFILL DAM

Flood Damage Reduction Projects

Local Protection Projects
Cherryfield
Fort Kent
Penobscot River, Old Town
Sebasticook River, Hartland

The Cherryfield Local Protection Project reduces damages from flooding caused by ice jams. The project creates an artificial lake that allows ice to melt or delays its downstream movement.

Cherryfield

The Cherryfield Local Protection Project is located on the Narraguagus River, one mile upstream from the center of Cherryfield. The town is a small berry-producing and fruit canning center about 20 miles northeast of Bar Harbor.

The Narraguagus River is subject to ice jams, which can cause severe flooding. The Cherryfield Local Protection Project is designed to reduce damages from flooding caused by ice jams. It safeguards Cherryfield's major industries, nearly half of the town's business establishments, approximately 25 homes, and several public buildings.

The project was constructed between June-December 1961 and cost $203,000. It was built under Section 205 of the Continuing Authorities Program and is maintained by Cherryfield.

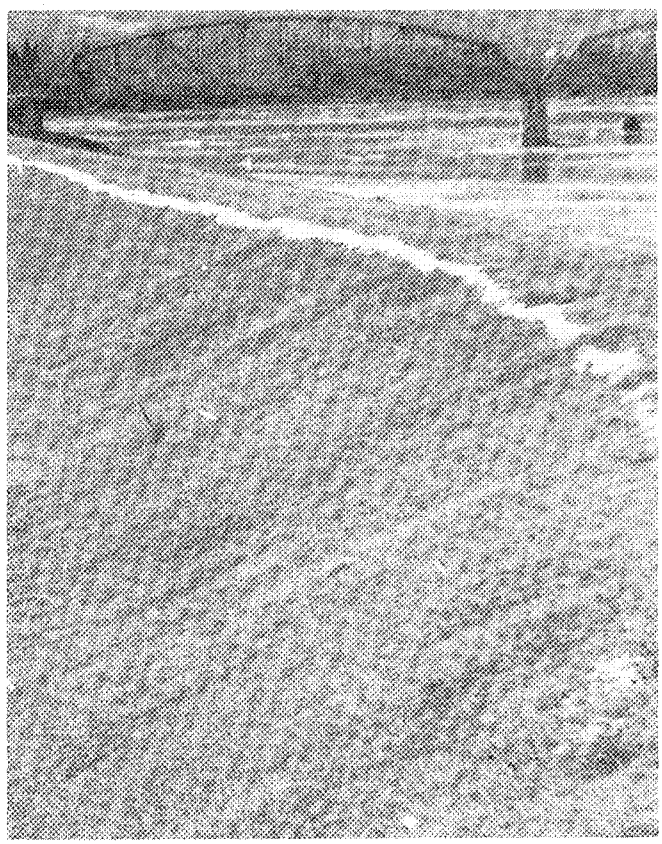
The project creates an artificial lake that either holds ice upstream until it decays in the spring or delays its movement downstream until after existing ice downstream breaks up. The structure, about 500 feet long, consists of two 24.5-foot-high timber crib abutments filled with stone, two earthfill embankments, 135 feet long on the east bank and 180 feet long on the west bank, and a 140-foot-long timber crib spillway, also filled with stone. The structure has provisions for stoplogs. Incorporated in the east abutment is a fishway that allows Atlantic salmon and other migratory fish to pass.

Fort Kent

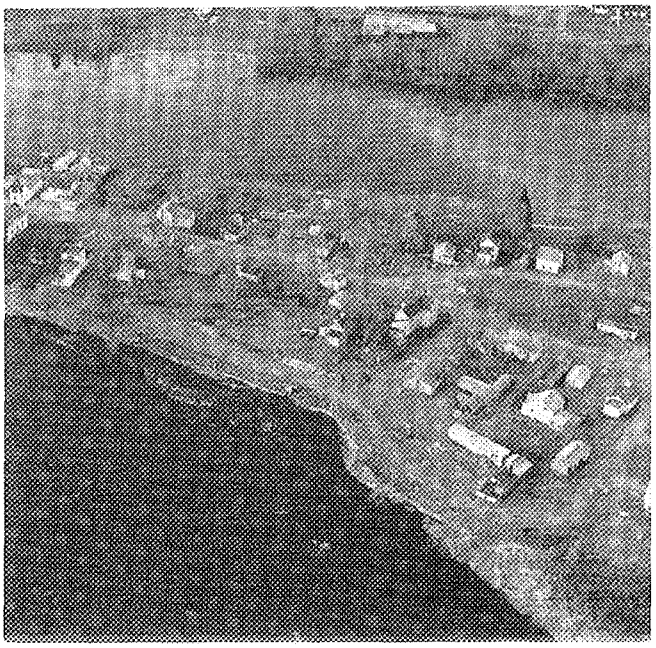
The Fort Kent Local Protection Project is located in Fort Kent, on the Saint John River at its confluence with the Fish River. At this location, the Saint John River forms the international boundary with Canada. The project provides flood protection to 48 acres of residential and commercial property in the business center of Fort Kent. This acreage is prone to flooding from the Saint John River during spring snowmelt.

Construction began in June 1976 and was completed in October 1977 at a cost of almost $2 million. It was constructed under Section 205 of the Continuing Authorities Program, and is operated and maintained by Fort Kent.

The project's main feature is an earthfill dike with stone slope protection 3,245 feet long and ranging from 5 to 12 feet high. The dike begins at a point about 370 feet upstream of the International Bridge and extends to an area near the Fort Kent Blockhouse. The project includes a concrete floodwall, pumping station, and 650 feet of pressure conduit that discharges interior drainage during high water periods. Construction also involved raising 550 feet of roadway embankment along the Fish River.



The main feature of the Fort Kent Local Protection Project is an earthfill dike 3,245 feet long that begins near the International Bridge, (background).



The Penobscot River Local Protection Project in Old Town consists of two earthfill dikes that provide flood protection to 4.5 acres of Indian Island. The east dike is 708 feet long, and the west dike is 581 feet long. The access road bridge can be seen on the far left of the photo.

Penobscot River, Old Town

The Penobscot River Local Protection Project is located on the Penobscot Indian Reservation, more commonly known as Indian Island, along the Penobscot River in Old Town. Indian Island is about 14 miles northeast of Bangor.

The project provides flood protection to 4.5 acres of low-lying land on the southern end of Indian Island. This area is the oldest developed area of the island, and it includes several homes, a church, a general store, the Indian Agent Office Building, and a cemetery.

Construction took place between May-November 1976 at a cost of $188,000. It was built under Section 205 of the Continuing Authorities Program, and is operated and maintained by the Penobscot Tribe.

The project involved modifying two earthfill dikes that were constructed as temporary flood protection in 1971. The dikes are located on the east and west banks of Indian Island, a short distance beyond the access road bridge. Modifications included raising the height of the dikes by three feet, and constructing stone slope protection. The east dike is 708 feet long, and the west dike is 581 feet long. Work also included improving interior drainage facilities.

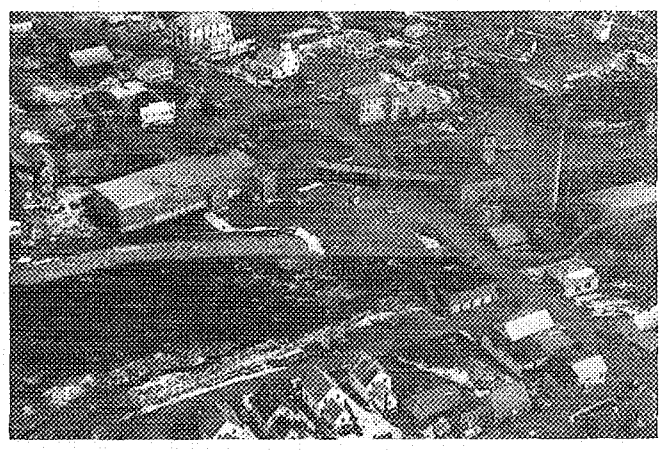
Sebasticook River, Hartland

The Sebasticook River Local Protection Project is located on the Sebasticook River in Hartland, about 30 miles north of Augusta. The project protects a tanning company and residential and commercial property. Construction began in November 1982 and was completed in November 1983 at a cost of $1.86 million. It was built under Section 205 of the Continuing Authorities Program and is operated and maintained by Hartland.

The project extends from Great Moose Lake to a point downstream of the Irving Tanning Company. Work included the construction of:

- Two earthfill dikes near North Street totalling 500 feet in length.
- A 170-foot-long earthfill dike along the east bank of the Sebasticook River, upstream of the Main Street Bridge.
- About 300 feet of stone slope protection along the east bank of the Sebasticook River, upstream of the Main Street Bridge. About 170 feet of the stone slope protection lies at the base of the 170-foot-long earthfill dike.
- Approximately 280 feet of stone slope protection along the west bank of the Sebasticook River, upstream of the Main Street Bridge.
- A 650-foot-long concrete floodwall along the east bank of the river, immediately downstream of the 300-foot-long stone slope protection.
- A 2,300-foot-long water supply pipeline extending from Great Moose Lake to the Irving Tanning Company that ensures the plant of an adequate supply of process water and fire protection.

The project also involved removing the Right Mill Dam upstream of the Main Street Bridge and sediment on the river bottom.



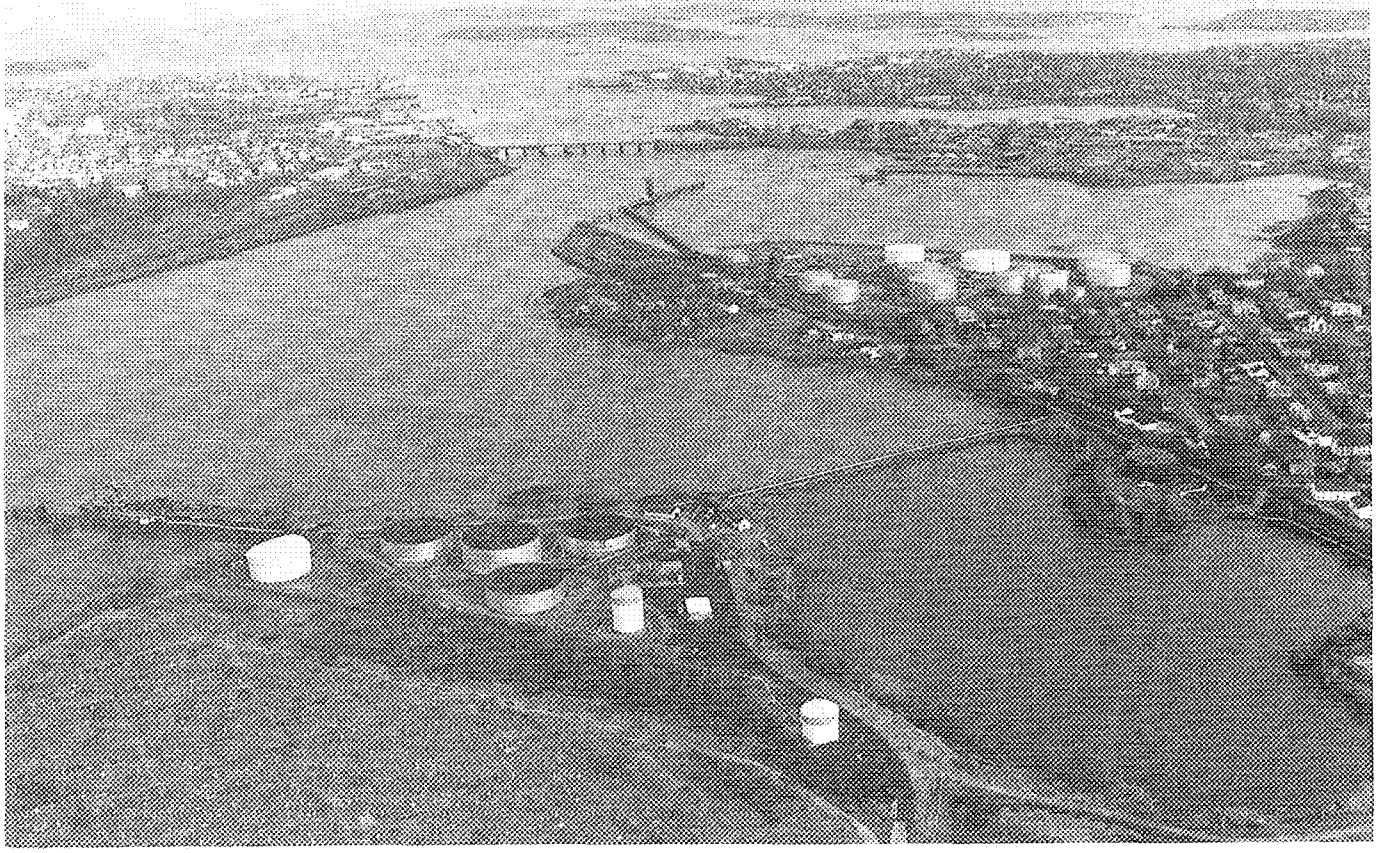
The Sebasticook River Local Protection Project in Hartland, was completed in November 1983 at a cost $1.86 million. The project features 300 feet of stone slope protection (above left), of which 170 feet protect an earthfill dike; and 650 feet of concrete floodwall adjacent to the stone slope protection (above right).

Navigation

The Corps has completed 66 navigation projects in Maine. These projects have improved rivers, bays, coves, and harbors that are used by commercial interests, fishermen, and the many recreational boaters that benefit from the intricate and fascinating Maine coastline.

Initial work on many of the projects dates back to the early 19th century. However, much of the navigational work in today's waterways has been constructed by the Corps within the past 50 years, costing an aggregate $29.7 million.

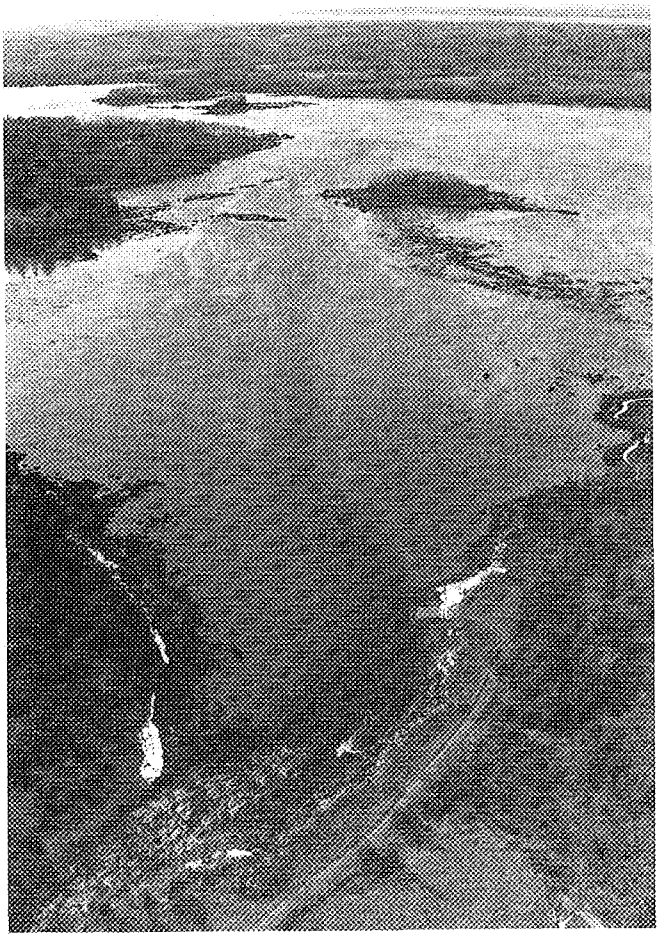
The following pages describe the Corps' navigation projects in Maine. Depths given for channels and anchorages are those at Mean Low Water.



Portland Harbor is the nearest American deepwater port to Europe and serves as a key center for shipping by both land and sea.

NAVIGATION PROJECTS

Bagaduce River
Bar Harbor
Bass Harbor
Bass Harbor Bar
Beals Harbor
Belfast Harbor
Boothbay Harbor
Bucks Harbor
Bucksport Harbor
Bunker Harbor
Camden Harbor
Cape Porpoise Harbor
Carver's Harbor
Cathance River
Cobscook Bay
Corea Harbor
Criehaven Harbor
Damariscotta River
Deer Island Thoroughfare
East Boothbay Harbor
Frenchboro Harbor
Harraseeket River
Hendricks Harbor
Isle au Haut Thoroughfare
Isles of Shoals Harbor
Jonesport Harbor
Josias River at Perkins Cove
Kennebec River
Kennebunk River
Lubec Channel
Machias River
Matinicus Harbor
Medomak River
Moosabec Bar
Narraguagus River
New Harbor
Northeast Harbor
Owls Head Harbor
Penobscot River
Pepperell Cove
Pig Island Gut
Pleasant River
Portland Harbor
Portsmouth Harbor and Piscataqua River
Richmond Harbor
Richmond Island Harbor
Rockland Harbor
Rockport Harbor
Royal River
Saco River
Saint Croix River
Saint George River
Sasanoa River
Scarborough River
Searsport Harbor
South Bristol Harbor
Southwest Harbor
Stockton Harbor
Stonington Harbor
Sullivan Falls Harbor
Tenants Harbor
Union River
Wells Harbor
Winter Harbor
Wood Island Harbor and Biddeford Pool
York Harbor



The 0.8-mile-long channel on the Bagaduce River in Penobscot stretches from Bridges Point (top of photo), past Winslows Island (top center) to Winslows Creek (bottom).

Bagaduce River

The Bagaduce River flows through Penobscot and empties into Penobscot Bay at Castine Harbor, about 25 miles northeast of Rockland. Traffic on the river consists of recreational craft, fishing boats, and training vessels of the Maine Maritime Academy in Castine.

Work on the Bagaduce River, completed in 1902, involved the construction of an 0.8-mile-long channel, 40 feet wide, extending from Bridges Point in Northern Bay, past Winslows Island, to Bowdens Wharf at Penobscot. The channel is six feet deep, except at Winslows Island, where it is four feet deep. The Corps also removed a small quantity of rock in South Bay at Johnsons Narrows, opposite Brooksville.

Bar Harbor

Bar Harbor, in the community of Bar Harbor, is located on the northeastern shore of Mount Desert Island in Frenchman Bay. One of New England's most popular summer resort areas, Bar Harbor is used extensively by a commercial fishing fleet and a growing charter boat industry and serves as a terminus for passenger and auto ferry service to Nova Scotia.

The project at Bar Harbor, completed in 1917, is a breakwater extending a total of 2,315 feet from Bald Porcupine Island southwesterly towards Cromwell Cove, ending about 600 feet short of the cove's entrance. The structure, located about one mile southeast of the main waterfront, is 895 feet long from Bald Porcupine Island to Dry Ledge, then 1,420 feet from Dry Ledge southwesterly towards Cromwell Cove. Although a portion of the breakwater was not constructed to its full height, the structure provides effective protection for the wharves and natural anchorage at Bar Harbor.

Bass Harbor

Bass Harbor in Tremont is a large cove located on the southwest side of Mount Desert Island in Blue Hill Bay, about 13 miles southwest of Bar Harbor. The Tremont sections of McKinley and Bernard abut the harbor and are home to a large commercial fishing fleet. The harbor also provides ferry and freight service to Frenchboro, Swans and numerous other offshore islands.

The project in Bass Harbor consists of three adjoining anchorages off the Bernard shore, between Tryhouse Point at the entrance to the harbor and Johns Island about 2,000 feet inside the harbor. The central anchorage is 10 feet deep and eight acres in area and provides access from the harbor entrance to the ledge area south of Johns Island. The westernmost anchorage, six feet deep and six acres in area, is located between the central anchorage and the Bernard shore, immediately north of Tryhouse Point. The uppermost anchorage is six feet deep and 10 acres in area and extends from the central anchorage to Johns Island, then swings northeasterly around the island.

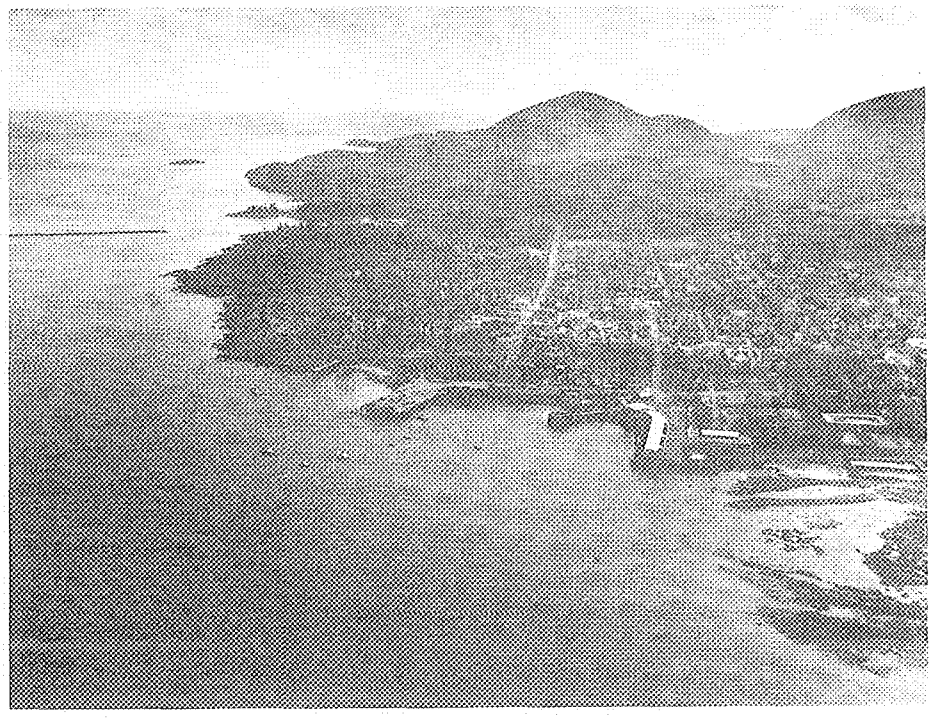
Completed in 1964, this work was constructed under Section 107 of the Corps' Continuing Authorities Program.

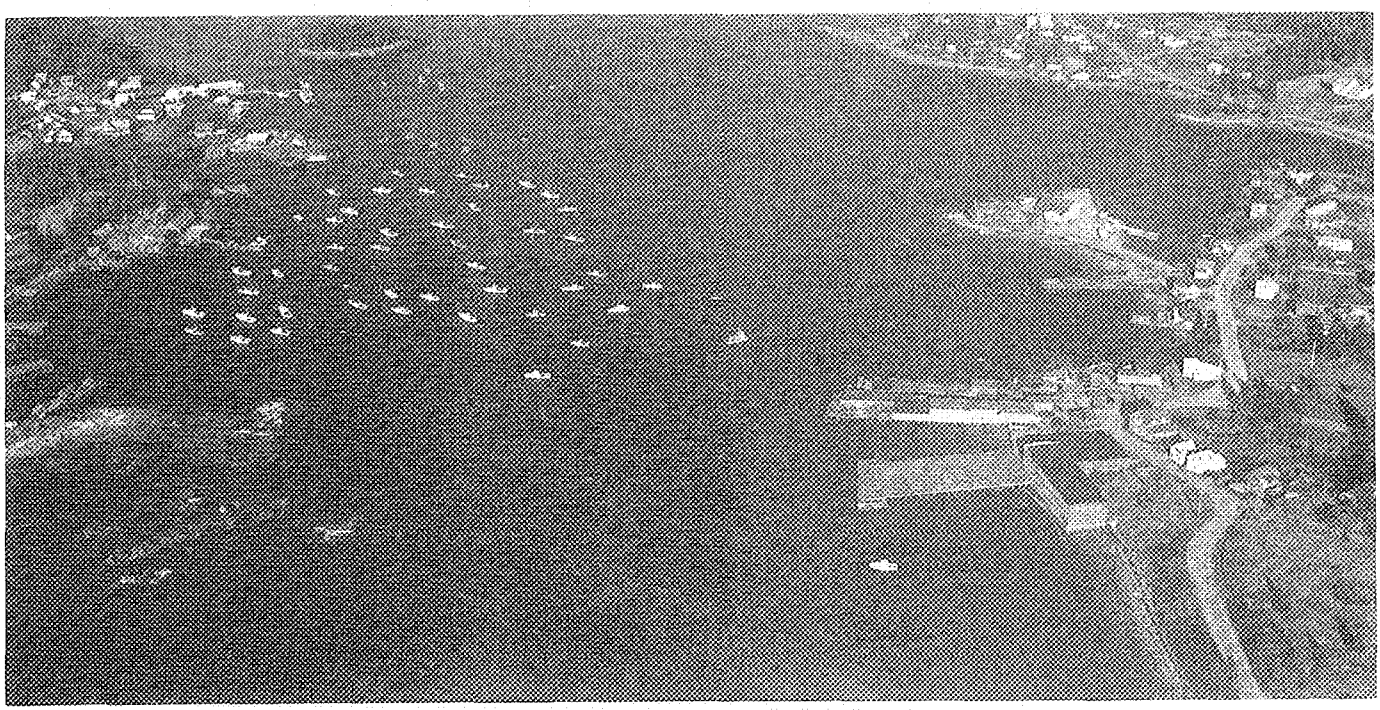
Bass Harbor Bar

Bass Harbor Bar in Tremont lies between the southern tip of Mount Desert Island and Great Gott Island. The bar is immediately east of Bass Harbor.

In 1913 the Corps completed a channel through the bar that clears a passage between Blue Hill Bay to the west and the Atlantic Ocean to the east. The project was constructed to provide fishing vessels, recreational craft, and other coastal traffic with a safer, shorter route around Mt. Desert Island. The channel, located about 1,000 feet south of Bass Harbor Head Lighthouse, is 14 feet deep and 250 feet wide.

Bar Harbor is one of New England's most popular summer resort areas. A portion of the Corps' 2,315-foot-long breakwater can be seen in the upper left corner.



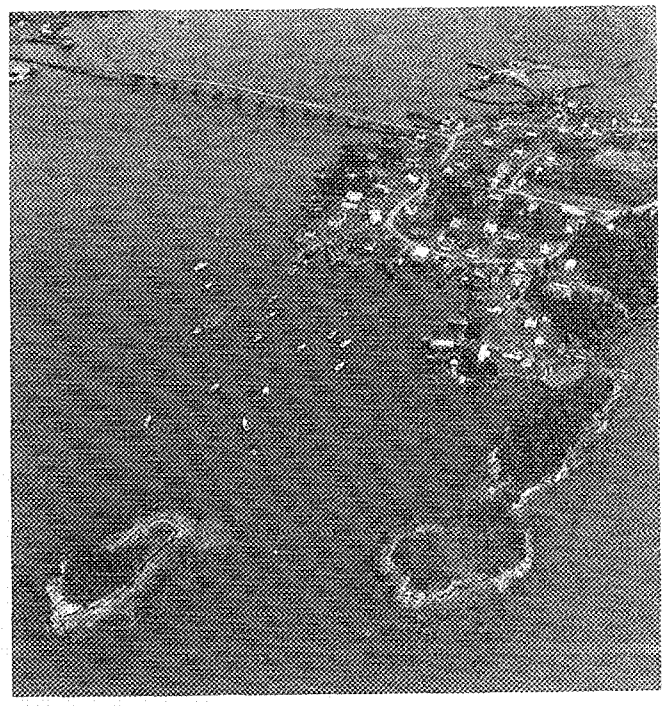


Bass Harbor in Tremont.

Beals Harbor

Beals Harbor in Beals, known locally as Barneys Cove, is located on the northwestern side of Beals Island along Moosabec Reach, opposite Jonesport and about 38 miles southwesterly of Eastport. A bridge connects this small fishing town with the mainland. Beals Harbor is used almost exclusively by commercial fishing boats, which principally catch lobsters, scallops, and groundfish.

The project consists of a 10-foot-deep anchorage in the harbor with an average length of 600 feet and a width that varies from 600-1,000 feet. The anchorage was completed in 1957. The dredged material was used to create intertidal flats south of the cove, along the west shore of Beals Island. The flats today are harvested for clams, periwinkles, and sea worms.



Beals Harbor

Belfast Harbor

Belfast Harbor in Belfast is located at the mouth of the Passagassawakeag River, which empties into Penobscot Bay, about 18 miles north of Rockland and 40 miles east of Augusta. The harbor, an important shipping center in the early 1800s, is home port to tugs which service commercial vessels, notably at Searsport Harbor. It is also a small fishing port and recreational boating harbor.

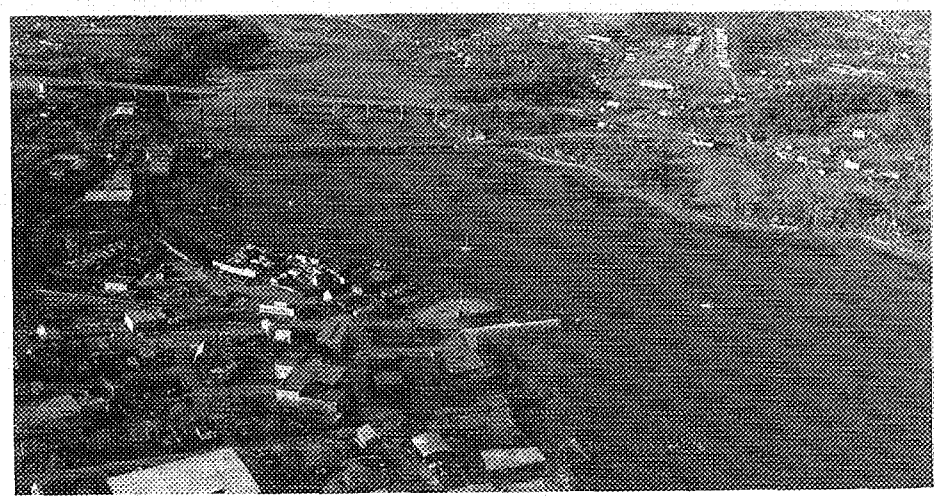
Original work in the harbor, completed in 1879, involved constructing a pier on Steels Ledge in the outer harbor and dredging an area in front of the main wharves to a depth of 10 feet.

The present project was completed in 1897. It consists of a 15-foot-deep channel, with a minimum width of 220 feet, extending from the harbor entrance off Pattersons Point to an area across from the wharves in Belfast and anchorage areas on the northeast and southwest sides of the channel. The anchorage on the east side of the channel, at the mouth of the Goose River, is eight feet deep; the anchorage on the channel's west side is 13 feet deep.

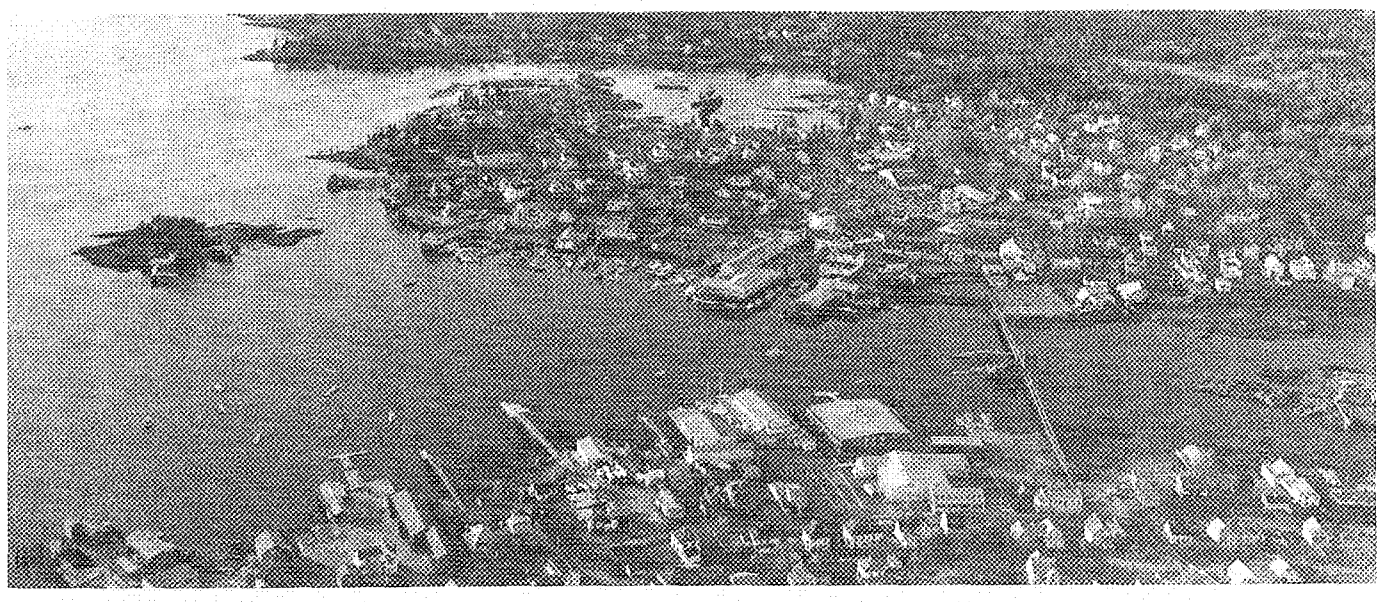
Boothbay Harbor

Boothbay Harbor is located in the community of Boothbay Harbor, about 11 miles southeast of Bath and 35 miles northeast of Portland Harbor. The harbor is a popular summer resort and one of New England's major yachting centers. A large fishing fleet, a number of boat construction firms, and charter and windjammer cruise boats utilize the harbor.

The project, completed in 1913, involved dredging along the wharves and the upper end of the inner harbor to a depth of 12 feet.



Belfast Harbor



Boothbay Harbor

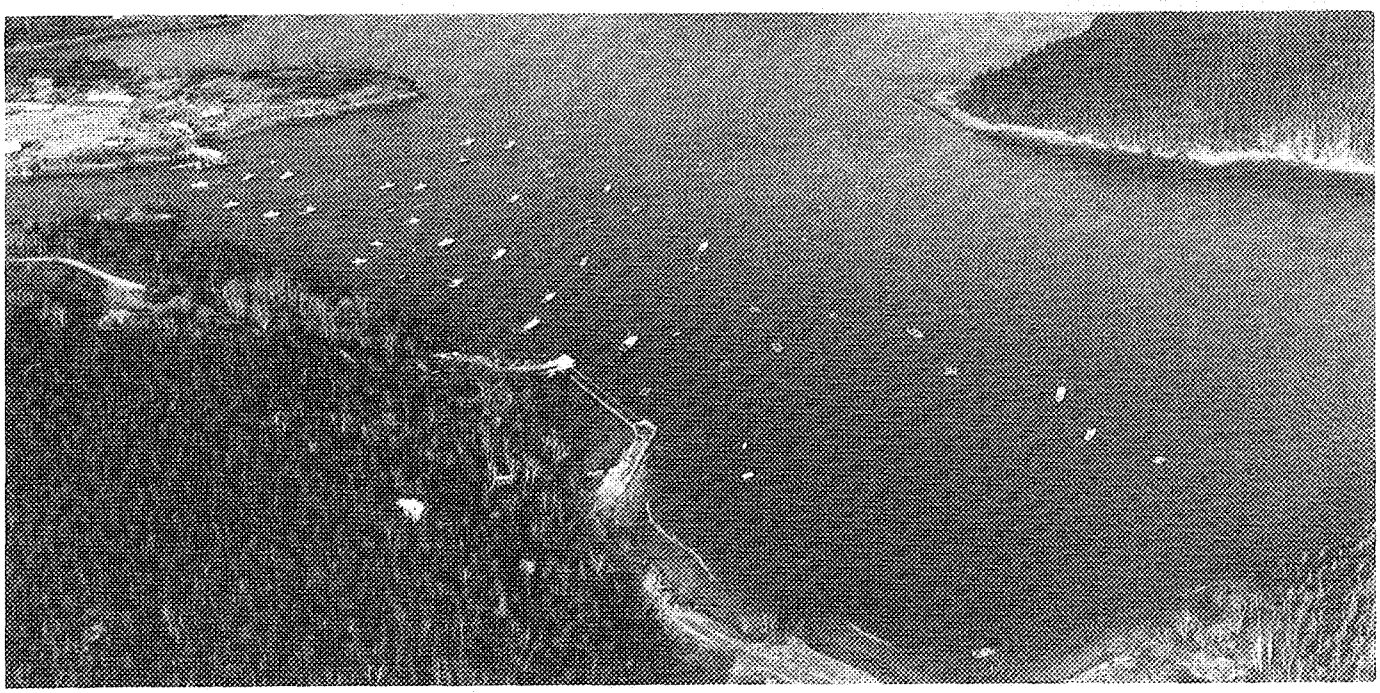
Bucks Harbor

Bucks Harbor is located in Machiasport on Machias Bay, about 25 miles southwest of Eastport. Bucks Harbor is formed by an inner and outer harbor and is used by a sizeable commercial fishing fleet and a small number of seasonal recreational craft.

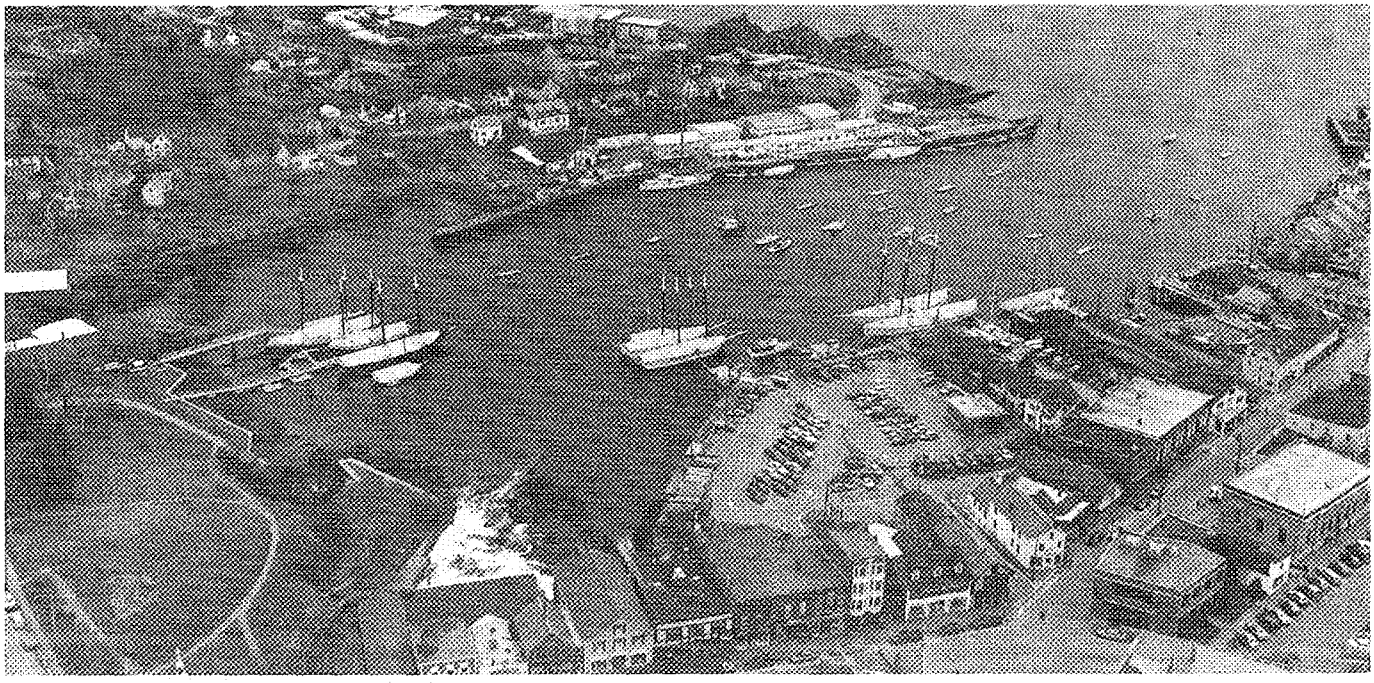
Corps' work in Bucks Harbor consists of an eight-foot-deep anchorage, 11 acres in area, on the western side of the outer harbor. The anchorage extends southeasterly from Sprague and Look Wharf at Bucks Neck towards Bucks Head. Completed in 1974, the anchorage was constructed under Section 107 of the Corps' Continuing Authorities Program.

Bucksport Harbor

Bucksport Harbor in Bucksport is located on the Penobscot River, about nine miles upstream of Penobscot Bay. The Bucksport waterfront is located on Eastern Channel, opposite Verona Island and historic Fort Knox. Traffic in Bucksport Harbor consists principally of small coastal tankers carrying petroleum products. Recreational boaters and a small commercial lobstering fleet also use the harbor.



Bucks Harbor in Machiasport. Shown is the outer harbor.



Camden Harbor is used extensively by a variety of craft, including small motorboats, windjammers, and large yachts and schooners.

Initial work in the harbor took place between 1875-78 when the Corps dredged an area known locally as the Middle Ground, situated opposite the central waterfront. The approximately 12.5-acre area was dredged to a depth of 12 feet in front of the wharves, and eight feet elsewhere. In 1903, the Corps modified its previous work by dredging the entire area to a depth of 16 feet.

Bunker Harbor

Bunker Harbor in Gouldsboro, one of several small harbors located along the shore of Schoodic Peninsula, is about three miles southwest of Prospect Harbor and nine miles east of Bar Harbor. Lobstering is the principal commercial activity.

Completed in 1968, the project consists of a six-foot-deep anchorage, three acres in area, in the inner harbor. The anchorage was constructed under Section 107 of the Corps' Continuing Authorities Program.

Camden Harbor

Camden Harbor in Camden is a small but well protected cove located in Penobscot Bay, about eight miles north of Rockland Harbor and 35 miles east of Augusta. Camden is a popular summer resort, and the harbor is used extensively by a variety of craft, including small motorboats, windjammers, and large yachts and schooners.

Original work in the harbor, completed in 1875, involved dredging two channels, each seven feet deep and 100 feet wide, on each side of the harbor. The channels had lengths of 1,400 feet and 1,500 feet. In 1897, the Corps dredged a 12-foot-deep area at the entrance to the harbor; a 10-foot-deep area in the main portion of the harbor; and small channels along the wharves in the harbor's upper end to a depth of five feet.

The project, as it is maintained today, consists of:

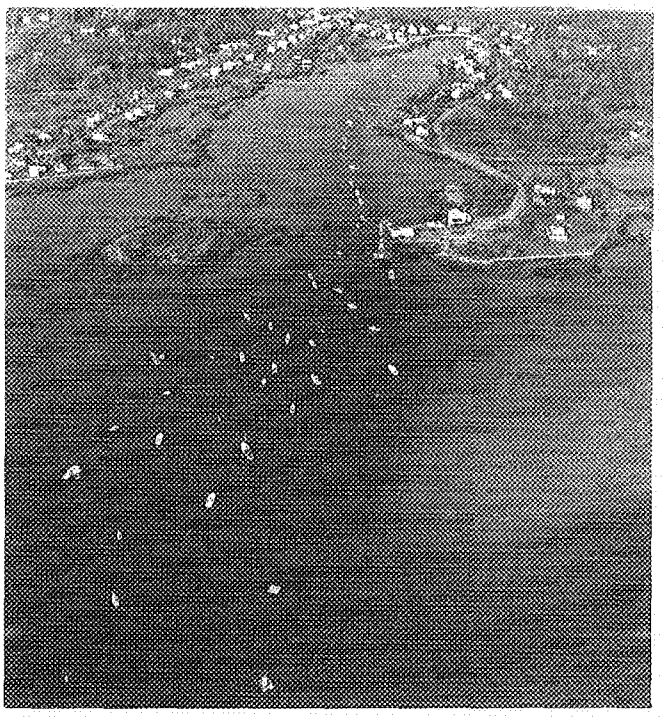
- An area 14 feet deep in the outer harbor, in the vicinity of Steamboat Wharf. This was completed in 1903.
- An area 10 feet deep in the inner harbor. This was completed in 1911.

Cape Porpoise Harbor

Cape Porpoise Harbor is located in the Cape Porpoise section of Kennebunkport, about 27 miles southwest of Portland. The harbor consists of three coves indenting the shore of Cape Porpoise, an active lobstering center with large fishing and recreational fleets. The town wharf is located on Bickford Island, which is connected by a causeway to Cape Porpoise.

Corps' work at Cape Porpoise Harbor began around the turn of the century, with the most recent work completed in 1950. This work involved:

- Deepening, straightening, and widening about 200 feet of the outer channel by removing ledge rock between Goat and Folly islands. The rock was removed to a depth of 18 feet, and the channel was widened to 200 feet.
- Constructing a 930-foot-long entrance channel, 16 feet deep, extending through the bar west of Goat Island to a point between Milk and Bass islands. The channel is 450 feet long and 200 feet wide through the bar, then



Cape Porpoise Harbor in Kennebunkport.

480 feet long and 200-500 feet wide between Milk and Bass islands.

- Constructing a combined channel and anchorage extending 2,150 feet from a point between Milk and Bass islands to the town wharf on Bickford Island. The channel is 15 feet deep with a maximum width of 600 feet.
- Constructing a 2,000-foot-long channel, six feet deep and 100 feet wide, extending from the town wharf to the head of Porpoise Cove.

Carver's Harbor

Carver's Harbor in Vinalhaven lies on the southern end of Vinalhaven Island in Penobscot Bay, about 15 miles east of Rockland Harbor. The harbor is used by a large lobstering fleet, fishing trawlers, many transient craft, and for freight and ferry service from Rockland.

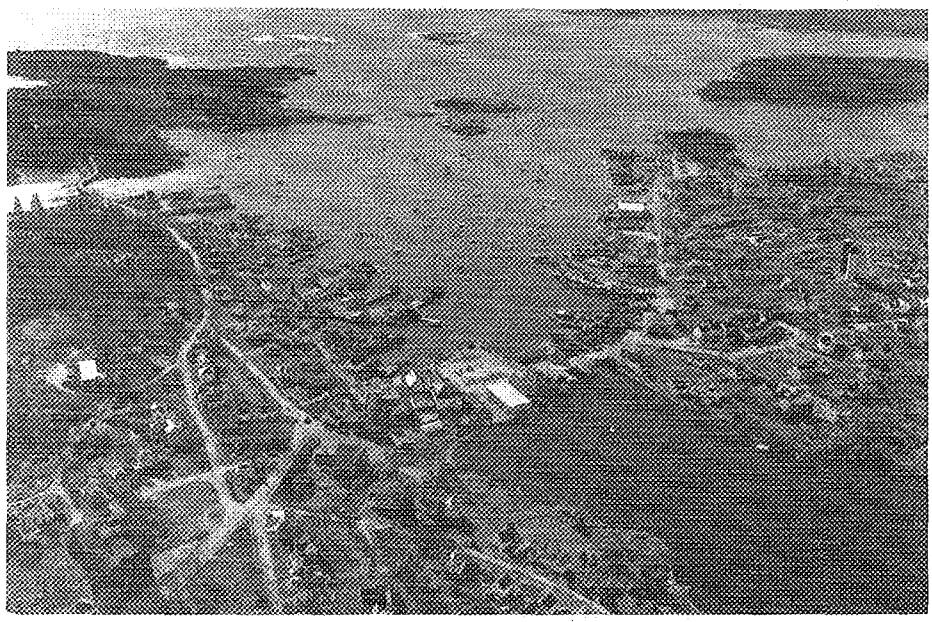
The earliest work in the harbor was completed in 1903. It consists of a 23-acre anchorage, 16 feet deep, in the main part of the harbor. Several years later, the Corps built two 10-foot-deep anchorages in the southern part of the harbor. The eastern anchorage is three acres in area, and the western anchorage is four acres in area.

The most recent work in Carver's Harbor was completed in 1964 and involved extending the 23-acre anchorage north to a point 50 feet from the wharves. This extension, three acres in area, is 10 feet deep. Also constructed at this time was a 500-foot-long channel and anchorage, six feet deep, extending from the northeastern side of the anchorage extension to the town landing. The channel has a width of 75 feet, and the anchorage has a width of 150 feet.

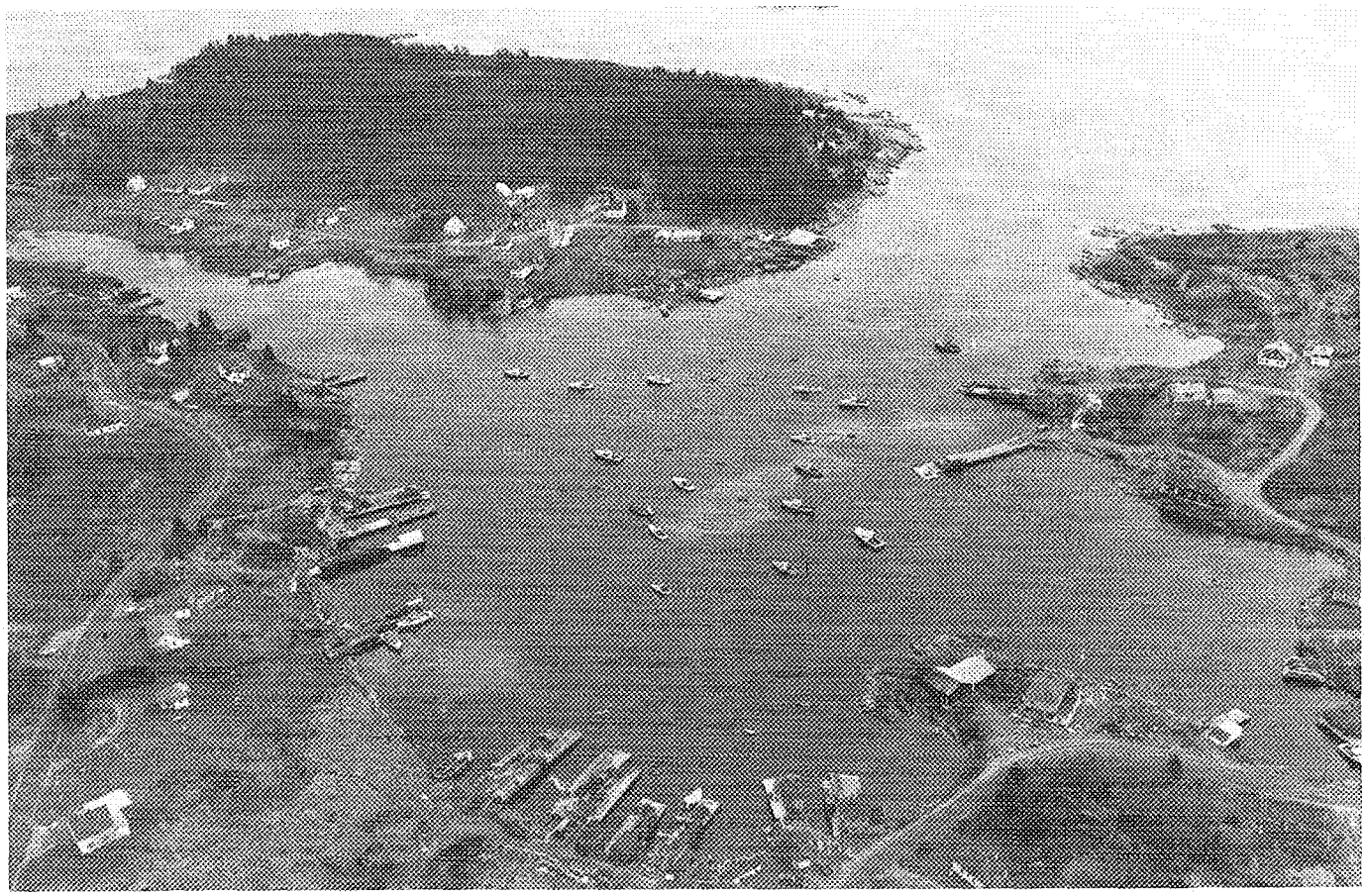
Cathance River

The Cathance River flows southeastwardly to Merrymeeting Bay in Bowdoinham, about five miles north of Bath. Navigational activity in Merrymeeting Bay, where the Androscoggin and Cathance rivers join the Kennebec River, is limited to transient recreational craft.

The project involved constructing a 2.1-mile-long channel, 10 feet deep and 200 feet wide, through Merrymeeting Bay. The channel extends eastward from the mouth of the Cathance River, through the bay, to a point near the confluence of the Cathance and Kennebec rivers known as "The Chops." The work was completed in 1883.



Carvers Harbor in Vinalhaven



Corea Harbor in Gouldsboro.

Cobscook Bay

Cobscook Bay in Pembroke, located about 1.5 miles west of Eastport, is an indentation of the Maine coast's northeastern end. The bay is used by fishing and recreational boats.

Corps' work in Cobscook Bay, completed in 1866, involved removing rocks from an area between Mahar Point at Leighton Neck and the western end of Falls Island. The rocks had obstructed navigation in the channel leading to Denny's Bay.

Corea Harbor

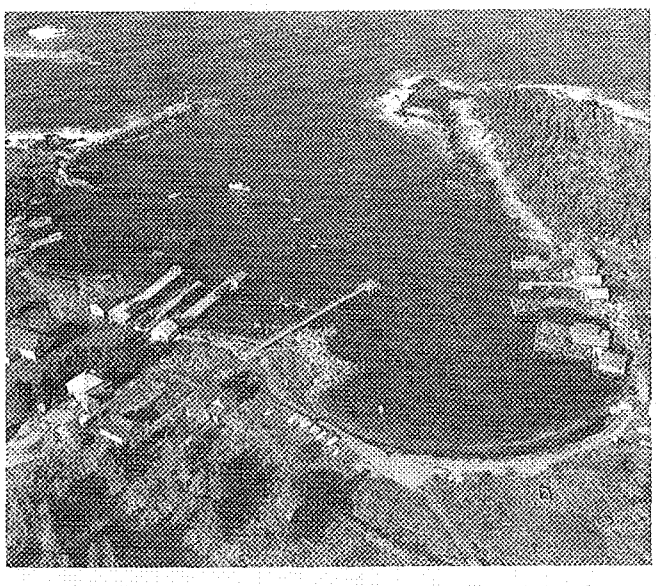
Corea Harbor in Gouldsboro, once known locally as Indian Harbor, is a small protected cove at the entrance to Gouldsboro Bay, about 12 miles east of Bar Harbor. The harbor serves a large lobstering fleet and a part-time fishing fleet.

The Corps has made two series of improvements to Corea Harbor. The first, completed in 1938, consists of an eight-foot-deep anchorage basin, 600 feet long and 400 feet wide, in the middle of the harbor. The second series of improvements, completed in 1983, consists of a 1,000-foot-long channel, eight feet deep and 100 feet wide, leading from deep water to the eight-foot anchorage, and two six-foot-deep anchorage areas, each 1.5 acres in area, located at the northeast and southwest corners of the eight-foot anchorage. Work completed in 1983 was constructed under Section 107 of the Continuing Authorities Program.

Criehaven Harbor

Criehaven Harbor in Matinicus Isle Plantation is located on the northwest side of Ragged Island. It is about two miles south of Matinicus Island, 15 miles south of Penobscot Bay, and 20 miles southeast of Rockland Harbor. Criehaven Harbor is used by local fishermen, who bring their catches to either Matinicus Island, Rockland Harbor, Port Clyde, or Tenants Harbor.

The project consists of a 300-foot-long stone breakwater extending northerly from Sunset Point. Works Progress Administration funds were used to build the structure, which was completed in 1935.



The breakwater (top left) at Criehaven Harbor in Matinicus Isle Plantation intercepts the energy of approaching waves, which benefits the local fishing fleet.

Damariscotta River

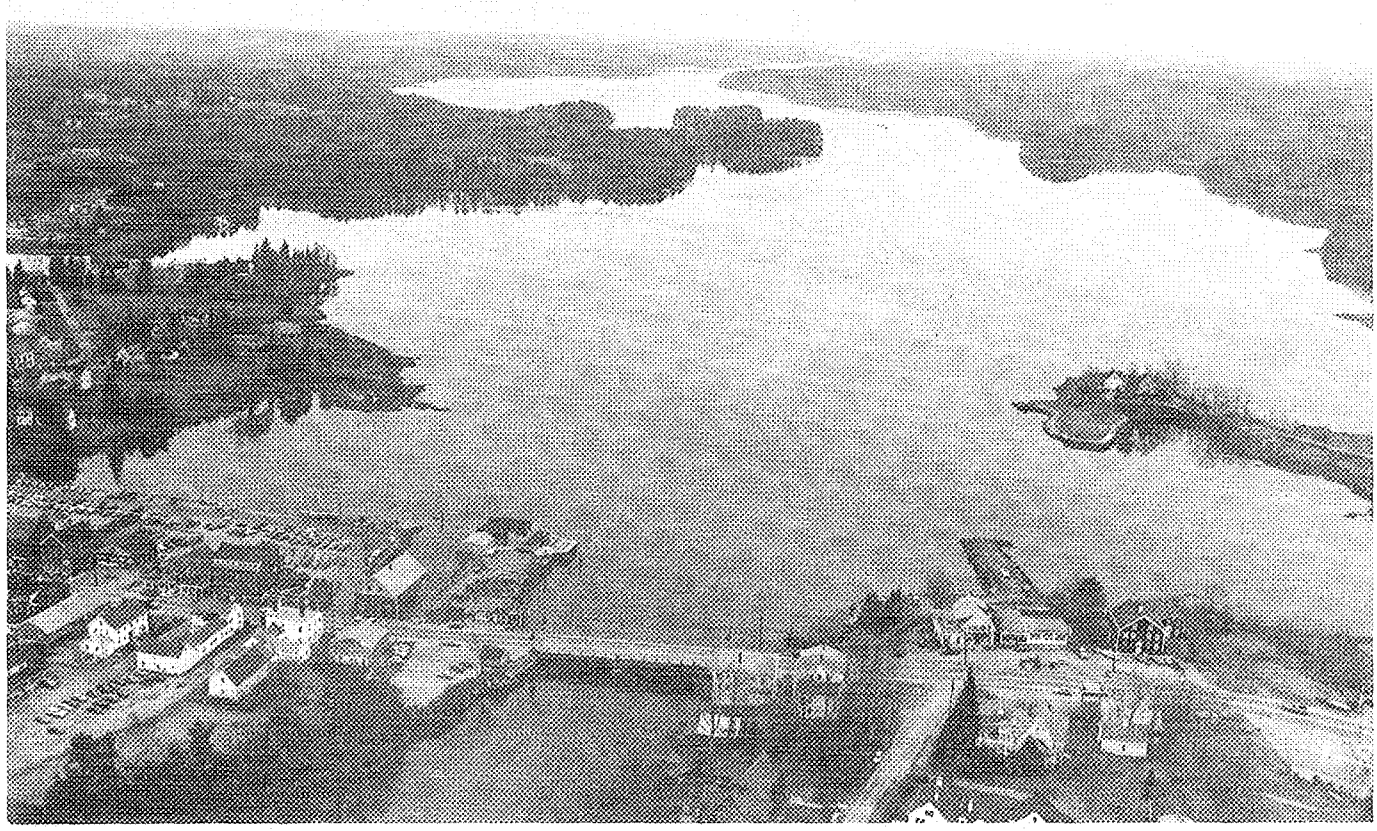
The Damariscotta River passes through Newcastle and Damariscotta and empties into the Atlantic Ocean about 15 miles downstream of these communities, at a point between Ocean Point and Inner Heron Island in Boothbay. A boat construction company and small fishing and recreational craft use the narrow, crooked waterway.

The project, completed in 1905, involved removing a shoal that was obstructing the approach to the wharves at Newcastle and Damariscotta, immediately below Route 1A. The shoal was removed to a depth of nine feet.

Deer Island Thoroughfare

Deer Island Thoroughfare in Stonington is a heavily travelled coastal navigational passage between Deer Isle on the north and a group of many smaller islands to the south. Located about 22 miles northeast of Rockland, the passage connects Penobscot Bay to the west with Jericho Bay to the east.

Corps' work in the waterway, completed in 1915, involved excavating rock from an area between Crotch and Moose islands. The rock was removed to a depth of 15 feet over an area 800 feet long and 300 feet wide. This allowed for a channel generally 400 feet wide through the entire thoroughfare.



The project on the Damariscotta River involved removing a shoal that was obstructing the approach to the wharves at Newcastle and Damariscotta. Route 1A runs along the bottom of the photo.

East Boothbay Harbor in Boothbay.

East Boothbay Harbor

East Boothbay Harbor in Boothbay is a small cove on the Damariscotta River, about three miles above the river's mouth and 12 miles southeast of Bath. The harbor is used by recreational boats and boat construction companies.

The project involved dredging the area along the wharves to a depth of eight feet. The work was completed in 1911.

Frenchboro Harbor

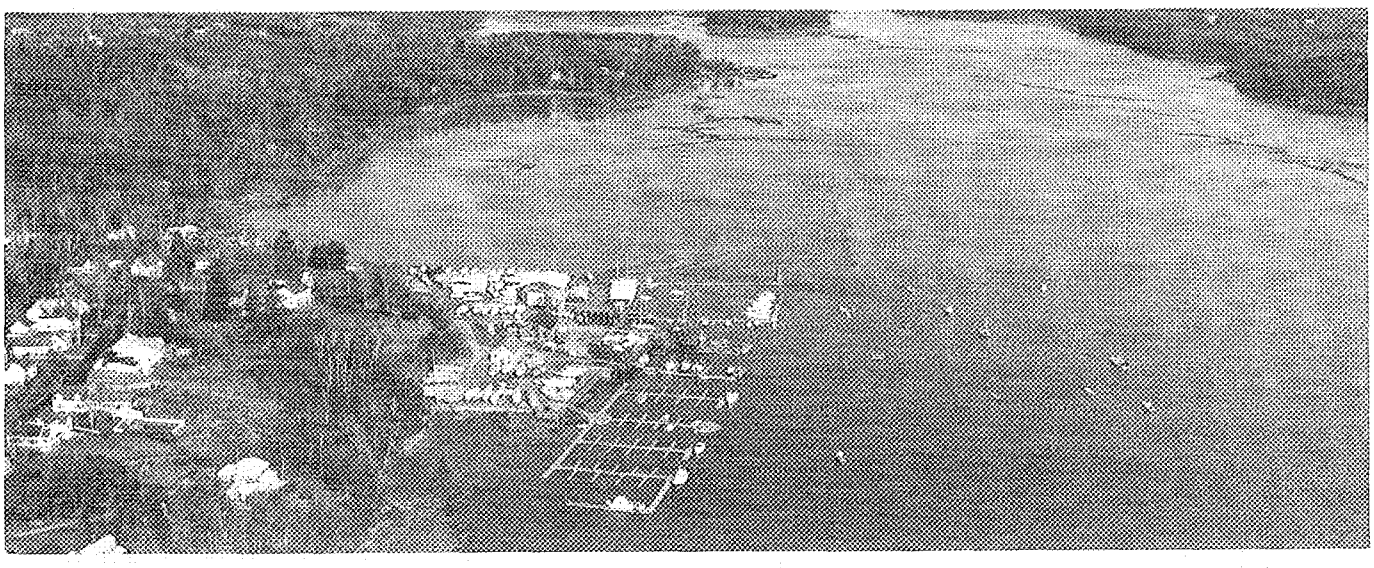
Frenchboro Harbor in Frenchboro, known locally as Lunt Harbor, is a shallow, narrow cove located on the northwest side of Long Island, about 20 miles south of Bar Harbor. The harbor is principally a fishing port and serves as a ferry terminal connecting the island with Mount Desert Island, which is connected to the mainland by a highway bridge.

The project, completed in 1977, consists of a 10-foot-deep anchorage, five acres in area, in the outer harbor; a six-foot-deep anchorage, 1.5 acres in area, in the inner harbor; and a six-foot-deep channel, 75 feet wide, connecting the two anchorages.

Harraseeket River

The Harraseeket River in Freeport empties into Casco Bay, about nine miles southwest of Brunswick and 12 miles northeast of Portland Harbor. The three-mile-long waterway, 0.6-mile-wide, is used by local and transient recreational craft.

The project consists of a 2.6-mile-long channel extending from the mouth of the Harraseeket River, between Moore Point on Wolf Neck and Stockbridge Point, to the wharves at Freeport Landing, located about one mile southeast of the Freeport business district. The channel is generally five feet deep and 90 feet wide, except for a section of the channel approaching Freeport Landing that is eight feet deep and 70 feet wide. There are two channel markers outlining the channel as it approaches Freeport Landing. The Corps also dredged an eight-foot-deep turning basin in front of the wharves at Freeport Landing. The project was completed in 1896.

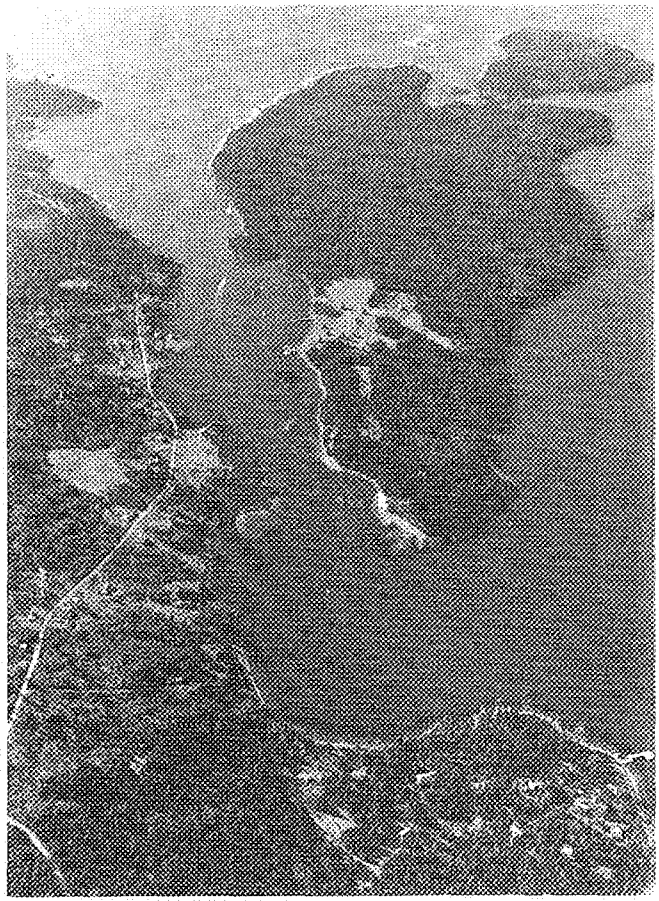


The Harraseeket River in Freeport.

Hendricks Harbor

Hendricks Harbor in Southport, known locally as Cozy Harbor, is located on the western shore of Southport Island, near the mouth of the Sheepscot River. Situated about 10 miles southeast of Bath and 50 miles northeast of Portland, the harbor is used by local fishing and recreational fleets and transient boats.

Completed in 1956, the project consists of a channel between Pratts and David islands that allows small commercial vessels to pass from the Sheepscot River into Hendricks Harbor. The channel is nine feet deep and 30 feet wide.



The Isle au Haut Thoroughfare. Kimball Island is on the right.

Isle au Haut Thoroughfare

The Isle au Haut Thoroughfare, immediately off the Isle au Haut coast, is a navigational passage between Isle au Haut and Kimball Island. Isle au Haut is located on the outskirts of Penobscot Bay, about six miles southeast of Stonington and 25 miles east of Rockland. The waterway provides access to home port for a small local fishing fleet and seasonal recreational craft, and affords protected passage for small vessels.

The project is a 1,200-foot-long channel, six feet deep and 75 feet wide, constructed through the shoal at the eastern end of the thoroughfare. It was completed in 1958.

Isles of Shoals Harbor

The Isles of Shoals are a three-mile-long cluster of seven rocky islands and ledges located off the coast of Maine and New Hampshire. Bisected by the boundary line of Kittery, Maine, and Rye, New Hampshire, the Isles of Shoals are about seven miles southeast of Portsmouth Harbor. Four of the smaller islands—Star, Cedar, Smuttynose, and Malaga are situated so that they afford a small harbor, known as Gosport Harbor. This harbor, 32 acres in area, is used by commercial, fishing, and recreational vessels, as well as excursion boats from Portsmouth. The Isles of Shoals are popular for summer conferences and are home to a marine biological center operated by Cornell University.

Work in the Isles of Shoals began as early as 1821, when private interests constructed a stone breakwater between Malaga and Smuttynose islands. In 1904, the Corps repaired and strengthened the breakwater to a length of 240 feet and constructed a second stone breakwater, 700 feet long, between Smuttynose and Cedar Islands. In 1913, the Corps repaired and strengthened the existing breakwaters and constructed a third stone breakwater, 530 feet long, between Cedar and Star islands. The breakwaters provide vessels with a safe refuge in Gosport Harbor.

Jonesport Harbor

Jonesport Harbor in Jonesport lies on Moosabec Reach, about midway between Bar Harbor and Eastport. It is about 190 miles northeast of Portland and 40 miles southwest of the American-Canadian border at Calais. The town's principal means of livelihood is commercial fishing, with the catch by local fishermen comprised of lobster, herring, scallops, shrimp, and finfish.

Because of its exposed location, Jonesport Harbor was vulnerable to storms and other natural forces. Fishing vessels were exposed to storm waves from the east and southeast, resulting in damage and lost fishing time. Ice packs drifting through the harbor also caused considerable damage. This exposure hampered the growth of commercial fishing and discouraged town officials from developing any adequate terminals from which the fishermen could operate. Although the state indicated that Jonesport Harbor was one of the 15 high-activity fish ports with priority fish pier needs, a fish pier could not be constructed until the problems caused by the harbor's natural exposure were eliminated or reduced. Since Jonesport depends almost entirely upon the fishing industry for its economic existence, a protected harbor is necessary for the economic health of the community and the safety of its fishing fleet.

In December 1987, the Corps began construction of a project at Jonesport Harbor that protects, maintains, and promotes the fishing industry. This project involved the construction of a 1,000-foot-long entrance channel, eight feet deep and 100 feet wide, extending from deep water in Moosabec Reach into Sawyer Cove; two anchorages within the cove, one eight feet deep and six acres in area, and one six feet deep and nine acres in area; and a 1,200-foot-long steel/combined cellular steel sheet pile and rubblemound breakwater at the entrance of the cove. The work was completed in December 1989 at a cost of $8.3 million.

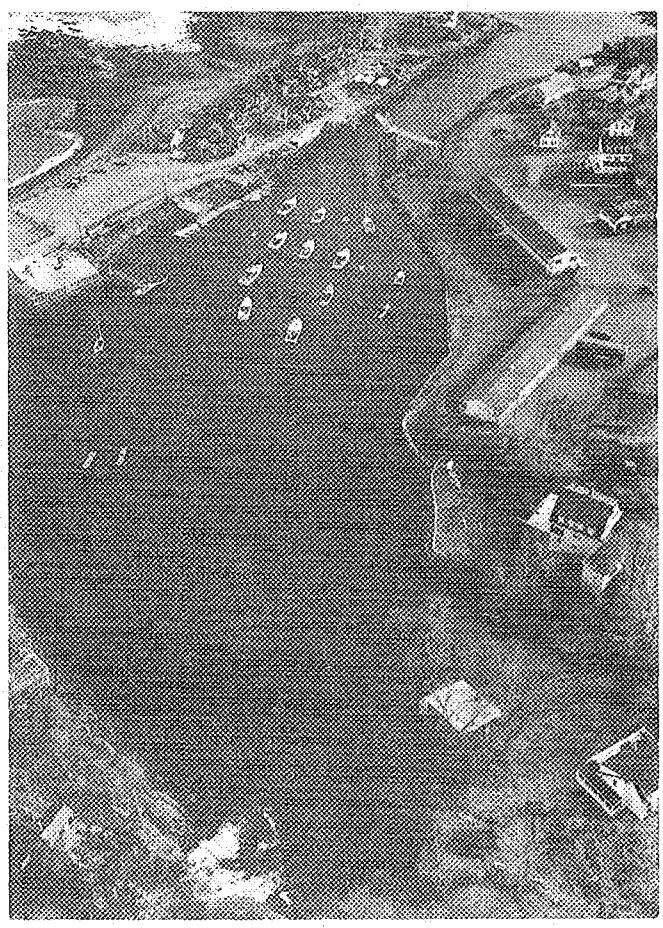
The breakwater and sheltered anchorage reduce or eliminate damages to vessels caused by rough weather and ice flows. It also reduces the cost of mooring maintenance, increases fishing time, and provides new markets for fish.

Josias River at Perkins Cove

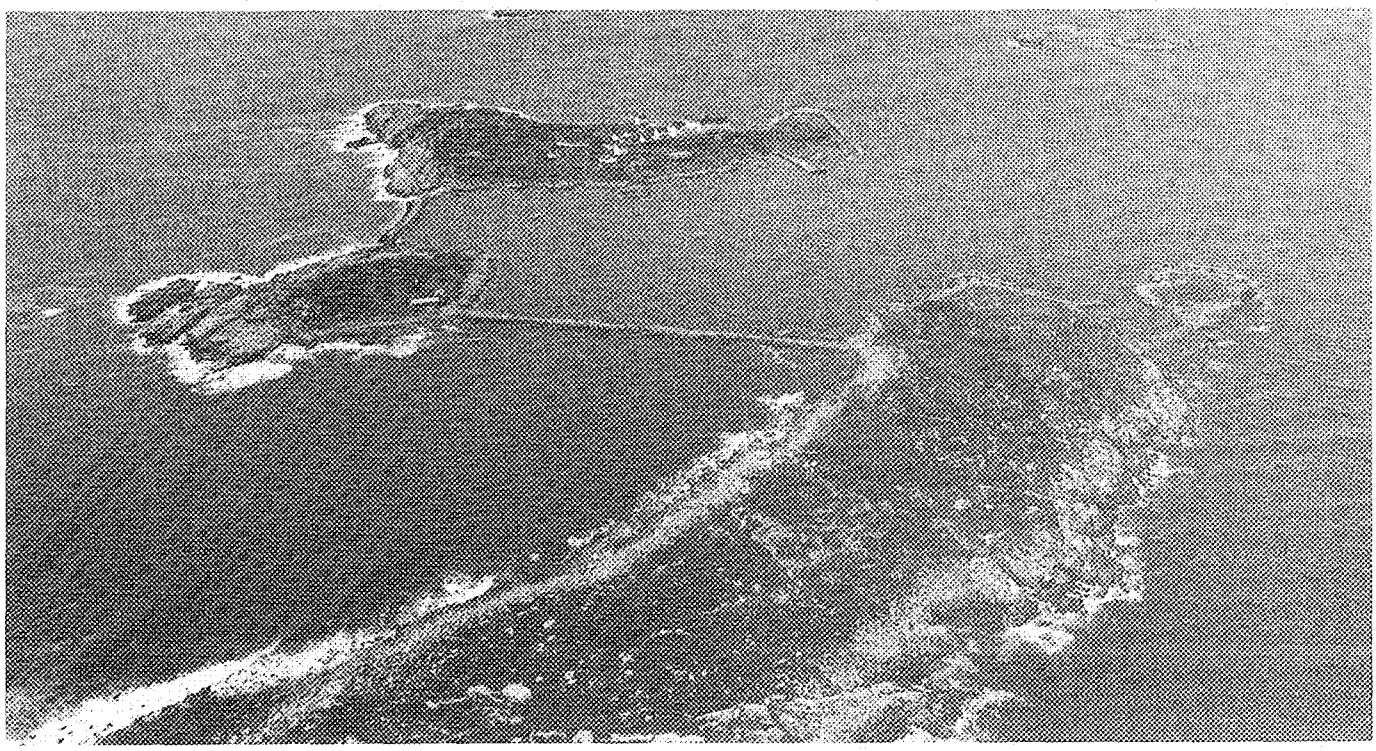
The Josias River flows eastward into Perkins Cove in Ogunquit, about 16 miles northeast of Portsmouth and 30 miles south of Portland. Perkins Cove is well-known for its scenery and is used extensively by local and transient recreational boats, sportfishing and charter craft, and lobster boats.

The project, completed in 1951, consists of:

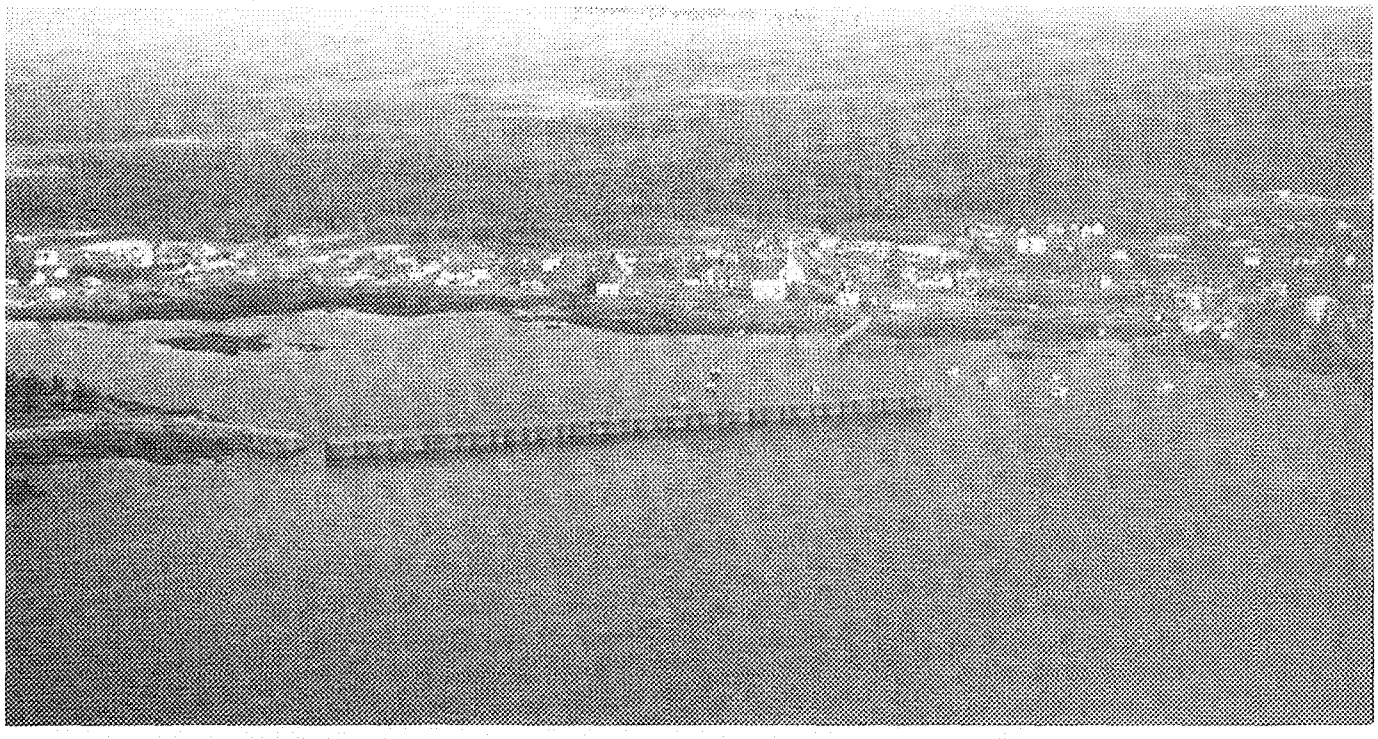
- A five-foot-deep anchorage at the head of the cove, 3.2 acres in area, in what was formerly known as Flat Pond. The anchorage has a maximum width of 400 feet.



Perkins Cove in Ogunquit is well-known for its scenery and is used extensively by local and transient recreational boats, sportfishing and charter craft, and lobster boats.



The three breakwaters at the Isles of Shoals form Gosport Harbor, in the center of the photo. The first breakwater connects Malaga Island, the small island at the far right, with the much larger Smuttynose Island; a second breakwater extends from Smuttynose Island across to Cedar Island (middle of photo); and the third breakwater connects Cedar Island with Star Island.



Jonesport Harbor

- A 900-foot-long channel, five feet deep and 40 feet wide, extending from Perkins Cove to the aforementioned anchorage.

In 1960, the Corps enlarged the anchorage by one acre in area, keeping its depth at five feet. The anchorage now has a surface area of 4.2 acres.

In 1993, the five-foot deep entrance channel and half of the anchorage areawere deepened to seven feet, except in area of ledge.

Kennebec River

The Kennebec River originates from Moosehead Lake in northern Maine and flows southerly for about 150 miles, emptying into the Atlantic Ocean at Popham Beach in Phippsburg, about 25 miles east of Portland. The river is navigable for about 43 miles from Phippsburg to Augusta, passing through the communities of Georgetown, Arrowsic, Bath, Woolwich, Bowdoinham, Richmond, Dresden, Pittston, Gardiner, Randolph, Farmingdale, Chelsea, and Hallowell. The river's principal commerce is associated with shipyard and ship machinery operations at Bath and the receipt of petroleum products, coal, and fish. The section of the river between Merrymeeting Bay in Bath and Popham Beach is popular with recreational boaters.

Initial improvements of the river began in 1827 and continued through 1888. These included removing obstructions, such as ledge rock, to provide a 13-foot-deep channel from the river mouth to Swan Island in Richmond, about 25 miles upstream, with its depth decreasing to 10 feet at Augusta. A secondary channel was constructed around the west side of Swan Island. In 1898, three jetties were constructed on the west side of Swan Island and one at Beef Rock Shoals, at the southeast end of Swan Island.

The project, completed in 1943, consists of:

- A channel 27 feet deep and 150 feet wide extending from the river mouth to a point 13 miles upstream at Bath.
- A channel 17 feet deep and 150 feet wide along the east side of Swan Island and extending to Gardiner. The channel depth increases to 18 feet through rock at Lovejoy Narrows, at the northeastern corner of Swan Island.
- A training wall at Beef Rock Shoals, at the southeast corner of Swan Island.
- A training wall above Sands Island, near the Dresden-Pittston town line.
- A 16-foot-deep channel at Gardiner.
- A channel 11 feet deep and 150 feet wide to the head of navigation in Augusta.

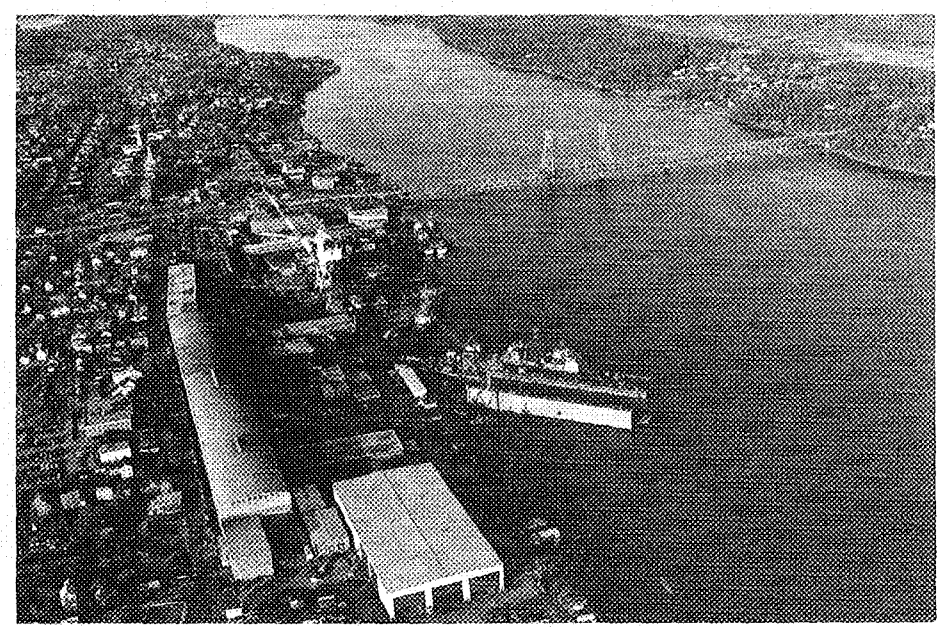
Kennebunk River

The Kennebunk River flows southeasterly along the border of Kennebunk and Kennebunkport, two popular summer resort communities on the coast of Maine, and empties into the Atlantic Ocean, about 30 miles southwest of Portland. The lower 1.1 mile of the river is used extensively by small lobstering and fishing fleets, yachts, and other recreational craft.

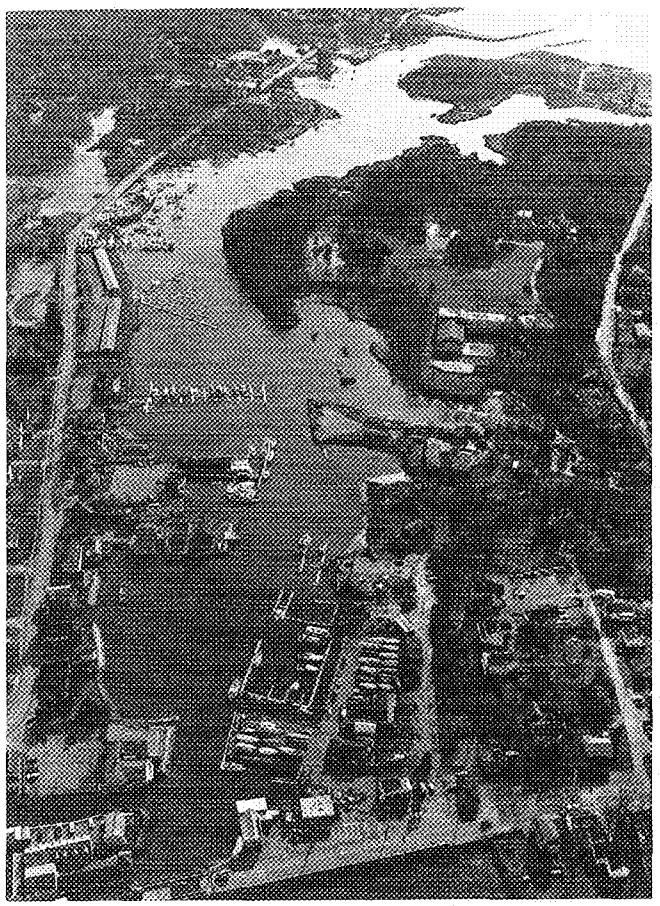
Original work by the Corps, completed in 1893, included construction of a 550-foot-long stone breakwater on the east side of the entrance to the Kennebunk River; a 290-foot-long stone jetty on the west side of the river entrance; a wharf (now the town landing), located about 700 feet upstream from the breakwater; a jetty on the east bank of the river, about 400 feet north of the wharf; and a four-foot-deep channel in the lower 1.1-miles of the river to Kennebunkport.

The most recent work in the Kennebunk River, completed in 1966, included construction of:

- A 1.1 mile-long channel with varying dimensions, extending from deep water to the vicinity of the Dock Square (Route 9) Bridge at Kennebunkport. For the first 1,700 feet, from deep water to the town landing, the channel is eight feet deep and 100 feet wide. From the town landing north for 2,300 feet, it is six feet deep and



The Kennebec River. The Bath Iron Works is at the bottom left.



The lower 1.1 miles of the Kennebunk River are used extensively by small fishing fleets and recreational craft.

100 feet wide. For its last 2,000 feet, to the vicinity of the Route 9 bridge at Kennebunkport, the channel is six feet deep and 75 feet wide.

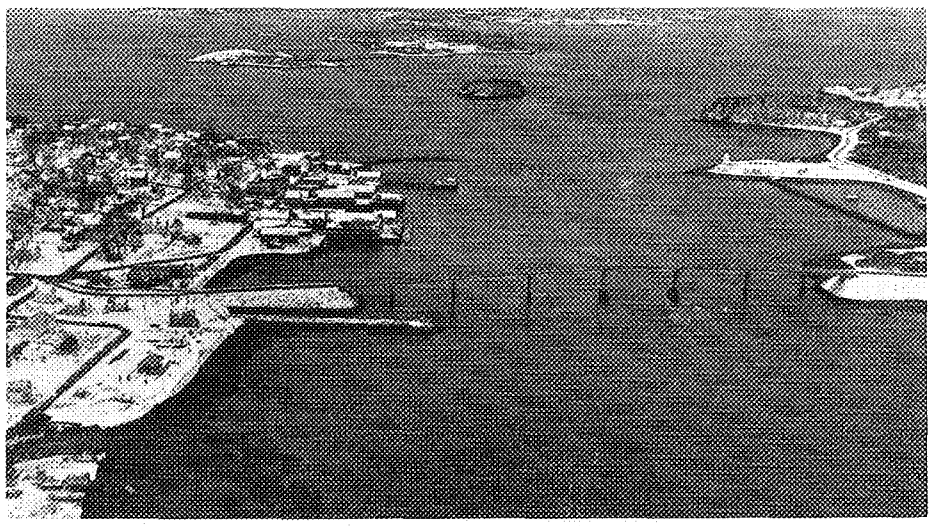
- A six-foot-deep anchorage, four acres in area, located on the west side of the channel across from the Nonantum Hotel.
- A six-foot-deep anchorage, two acres in area, located on the east side of the channel, immediately upstream of the four-acre anchorage.
- A 300-foot-long extension of the west jetty.
- A 500-foot-long sand fence extending from the base of the west jetty to Gooch Beach.

Lubec Channel

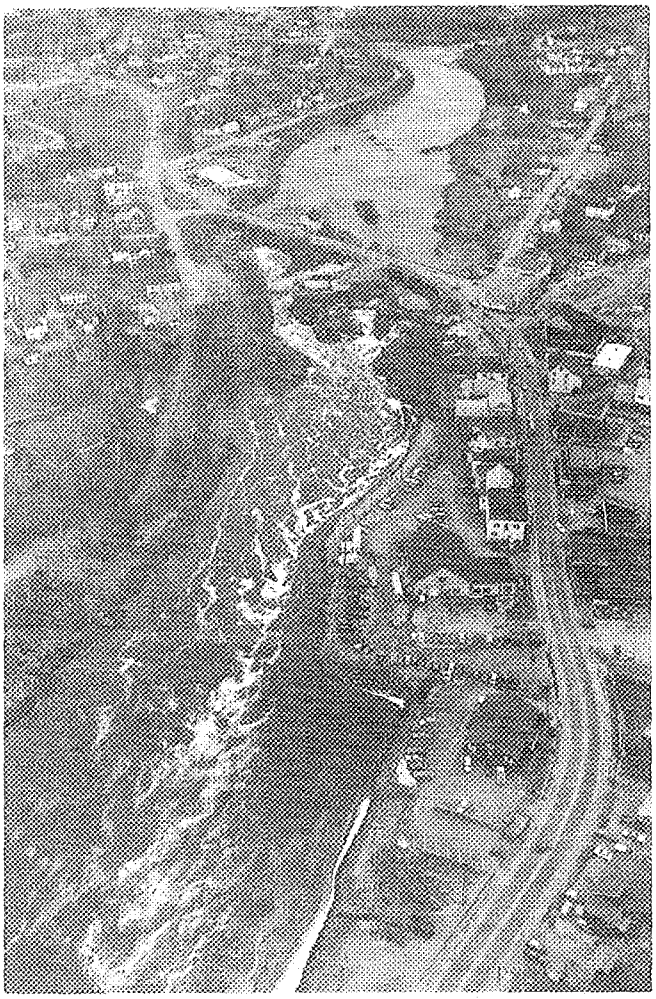
Lubec Channel is located in the international boundary waters between Lubec and Campobello islands, New Brunswick. It is heavily traveled by commercial and fishing traffic bound to Lubec, Eastport, and other ports on Passamaquoddy Bay and the St. Croix River. Lubec is a sardine and shellfish center, with commercial waterfronts on Lubec Neck.

The channel was constructed by the Corps in 1890. It is two miles long, 12 feet deep, and when originally constructed, 275 feet wide (300 feet at the bends). It extends from Quoddy Roads through Lubec Narrows into Friar Roads. The Corps also built a breakwater extending from the northeastern end of Lubec Neck to Gun Rock.

The Corps made three improvements to Lubec Channel in 1956. The channel was widened to 500 feet; a 385-foot-long stone breakwater was constructed at Short Point, located immediately south of the Roosevelt Memorial Bridge; and the breakwater at Gun Rock was extended by 90 feet.



Lubec Channel is situated in Lubec Narrows between Lubec (left) and Campobello islands in New Brunswick, Canada. The Roosevelt Memorial Bridge connects the two countries.



The Machias River in Machias.

Machias River

The Machias River originates at Machias Lake and flows southeasterly for 45 miles before emptying into Machias Bay at Machiasport, about 10 miles south of Eastport. The river, which flows through the communities of Machias, East Machias, and Machiasport, is used by fishing and lobster boats, recreational craft, and boats delivering building materials and supplies to nearby islands.

The project involved removing ledge and shoals in the river below Machias to provide boats with a six-foot-deep channel, not less than 100 feet wide, extending about three miles from the East Machias Bridge in Machiasport to the wharves at Machias. The work was completed in 1876 and included the removal of a large ledge at Middle Rock, opposite the Machias wharves.

Matinicus Harbor

Matinicus Harbor in Matinicus Isle Plantation is located on the eastern side of Matinicus Island, approximately 15 miles south of Vinalhaven Island and 23 miles southeast of Rockland Harbor. Matinicus Island is the largest of a group of islands off the mouth of Penobscot Bay. The harbor is used by local fishermen and mail and freight boats from Rockland Harbor.

The project consists of a 450-foot-long breakwater extending southeasterly from Youngs Point to Indian Ledge. The breakwater was completed in 1911 and underwent major rehabilitation in 1962.

Medomak River

The Medomak River flows through Waldoboro and empties into Muscongus Bay, about 15 miles west of Rockland Harbor. The riverway is used by fishing and lobstering fleets.

The project on the Medomak River, completed in 1913, is a 1.25-mile-long channel that terminates at Waldoboro. The channel is five feet deep and 75 feet wide.

Moosabec Bar

Moosabec Bar in Jonesport is located near the eastern end of Moosabec Reach, a narrow passage between Chandler Bay and Western Bay that separates the group of islands forming the town of Beals on the south from the mainland at Jonesport on the north. Moosabec Reach, roughly midway between Bar Harbor and Eastport, is used as a protected passage by the many fishing boats and coastal recreational traffic travelling between their home ports and the fishing grounds to the southeast. Jonesport is one of Maine's most prominent fishing and canning centers and home to a U.S. Coast Guard station.

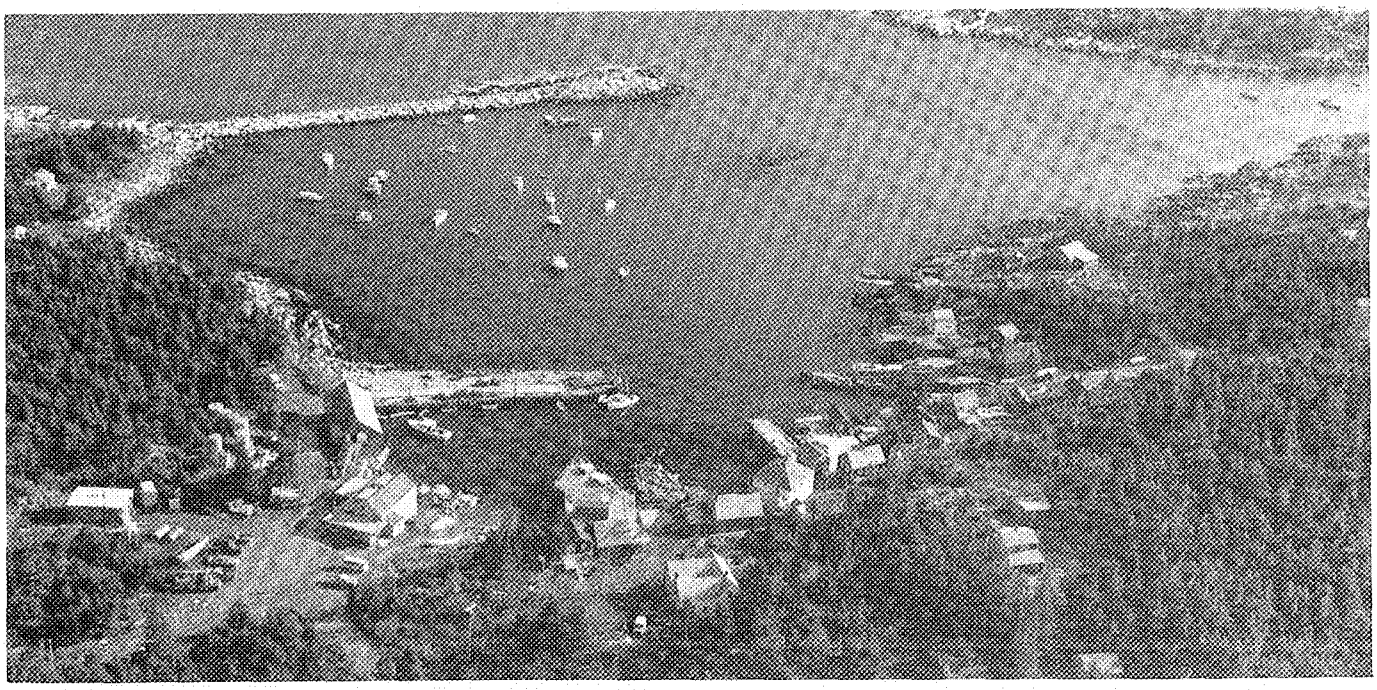
The project, completed in 1899, consists of a channel, 14 feet deep and 300 feet wide, through Moosabec Bar; and a small stone breakwater on the channel's southern side, opposite Kelley Point.

Narraguagus River

The Narraguagus River flows southeasterly through the towns of Cherryfield and Milbridge and empties into Narraguagus Bay, about 20 miles east of Bar Harbor and 10 miles west of Jonesport. The waterway serves blueberry and sardine canning industries in Wyman and Milbridge, the local fishing fleet, and a small recreational fleet.

Initial work on the Narraguagus River, completed in 1874, consisted of removing boulders and other navigational obstructions between Milbridge and Cherryfield. The present project, completed in 1966, consists of:

- A 3.2-mile-long channel with varying dimensions extending from deep water in Narraguagus Bay (at a point opposite Turner Point in Wyman) to the Cherryfield town



Matinicus Harbor in Matinicus Isle Plantation. The 450-foot-long breakwater is on the left.

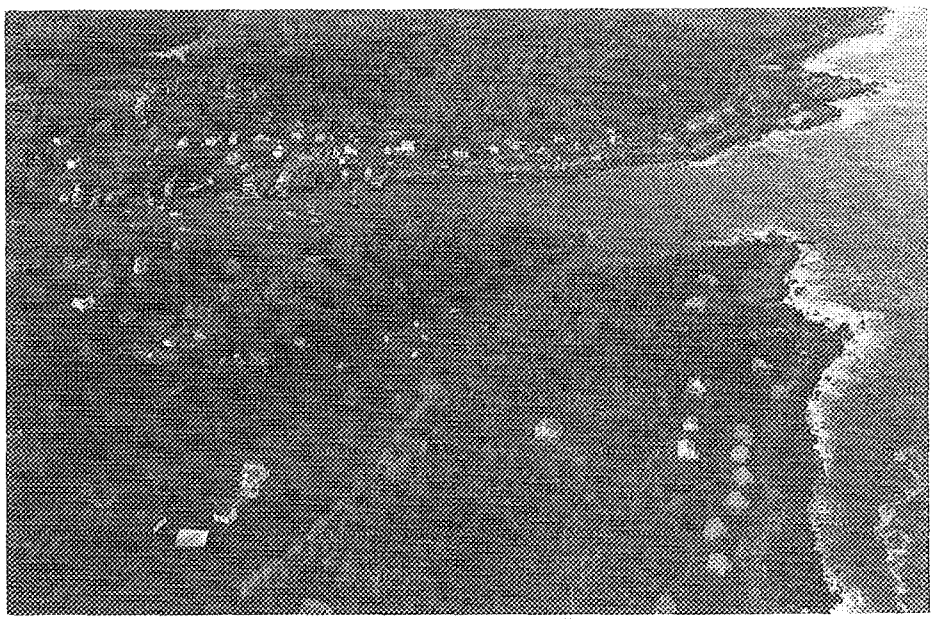
wharf, near the U.S. Route 1A Bridge. From deep water to Mitchell Point in Wyman, the channel is 11 feet deep and 150 feet wide. From Mitchell Point to the lower wharf in Milbridge, the channel is nine feet deep and 100 feet wide. The channel depth then decreases to six feet to its end at the Cherryfield town wharf.

- A six-foot-deep anchorage on the western side of the six-foot-deep channel, immediately past the lower wharf in Milbridge.
- A six-foot-deep anchorage on each side of the six-foot-deep channel as it approaches the Cherryfield town wharf.
- A six-foot-deep turning basin at the end of the channel, adjacent to the Cherryfield town wharf.

New Harbor

New Harbor in Bristol consists of two small coves in Muscongus Bay, 2.5 miles north of Pemaquid Point and 17 miles east of Bath. The harbor is used by local fishing and small recreational fleets and transient craft.

The Corps initially completed work at New Harbor in 1905, when it built two adjoining anchorages in the northern and larger of the two coves. The outer anchorage is 12 feet deep



Local fishing and recreational fleets are the primary users of New Harbor in Bristol. The larger of the two coves is prominent in the photo, while the smaller cove can be seen at the top.

and three acres in area, and the inner anchorage is six feet deep and 3.6 acres in area.

In 1966, the Corps modified its work in New Harbor by dredging three additional anchorage areas, all six feet deep, under Section 107 of the Continuing Authorities Program. The first anchorage was built in Back Cove (the smaller cove) and is 2.2 acres in area. The second and third anchorage areas are extensions to the two existing anchorages in the main harbor. The outer anchorage was extended by 0.7 acre along its southern limit, and the inner anchorage was extended by 0.7 acre westerly toward the head of the main harbor.

Northeast Harbor

Northeast Harbor in Mount Desert is a large protected cove on the southeastern side of Mount Desert Island. Located about 11 miles southwest of Bar Harbor, Northeast Harbor is a popular yachting center and summer resort area, and provides a well protected winter anchorage for commercial fishing boats and lobstering craft.

The project, completed in 1954, consists of:

- An 800-foot-long channel extending from the middle of the harbor to two town landings on the west side of the harbor. The 10-foot-deep channel is 650 feet wide at its entrance and narrows to 250 feet as it approaches the landing areas.
- Two anchorage areas, each seven feet deep, on either side of the channel. The anchorages total about 18 acres in area.

Owls Head Harbor

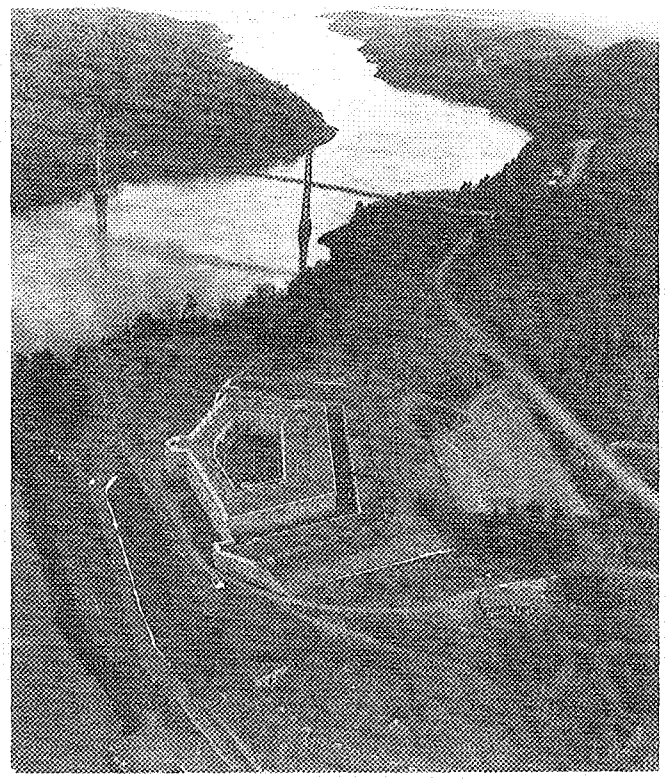
Owls Head Harbor in Owls Head is located at the lower end of Penobscot Bay. It is a small fishing, lobstering, and recreational port lying west of Munroe Island and adjacent to Rockland Harbor.

Development of the harbor began in 1858 when the Corps completed a breakwater at Dodge Point that formed a harbor of refuge for sailing vessels. Time and weather have since destroyed the breakwater, which is no longer needed for today's navigation.

The most recent work in Owls Head Harbor is a six-foot-deep anchorage, eight acres in area, at the town float and adjacent to a series of lobster pounds. Completed in 1967, the anchorage was built under Section 107 of the Corps' Continuing Authorities Program.

Penobscot River

The Penobscot River rises in several tributaries northwest of Moosehead Lake near Maine's northwestern border with Quebec. These tributaries flow nearly 100 miles southeasterly to the main river in Medway. The main river flows southerly, through Bangor, for 93 miles and empties into Penobscot Bay, between Stockton Springs and Castine. The navigable section of the river is the approximately 30-mile reach between Bangor and Castine. Of this section, Corps' work covers the channel's 20 miles between Bangor and Bucksport, which passes through the towns of Brewer, Hampden, Orrington, Winterport, and Frankfort. Because the last 10 miles of the river, between Frankfort and Castine, is naturally deep, dredging was not required by the Corps. This 10-mile section of channel passes through the towns of Verona, Prospect, Orland, Penobscot, and Stockton Springs.



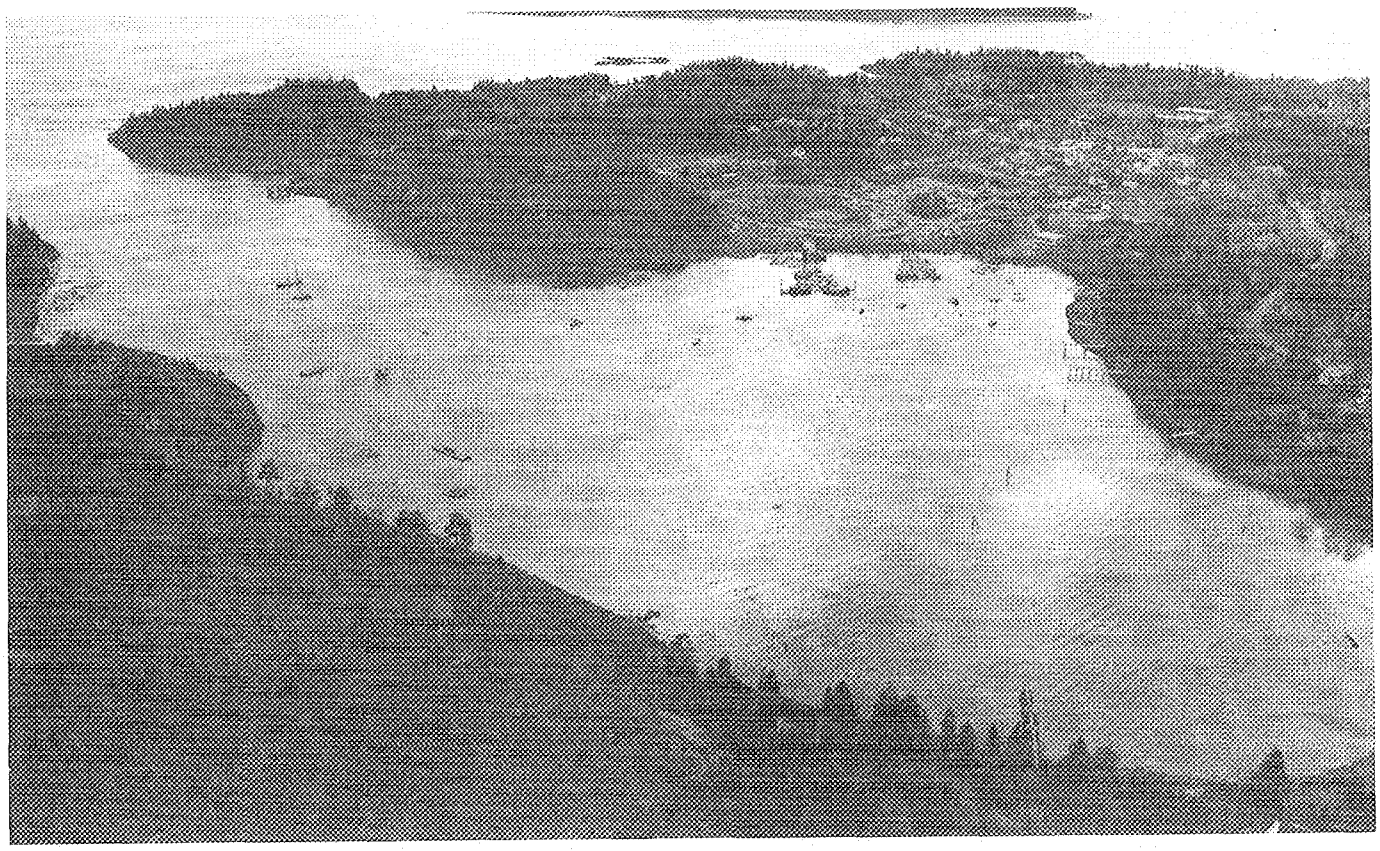
The Penobscot River in Bucksport. In the foreground is Fort Knox, built in 1838 to defend the United States against British Canadians mobilizing in Canada as a result of border disputes with the US Government. The fort was also used during the Civil War and Spanish-American War.

Small tankers transporting petroleum and asphalt products to Bangor and other communities make up the river's principal traffic. Recreational and commercial fishing craft primarily use the Penobscot River's lower reaches.

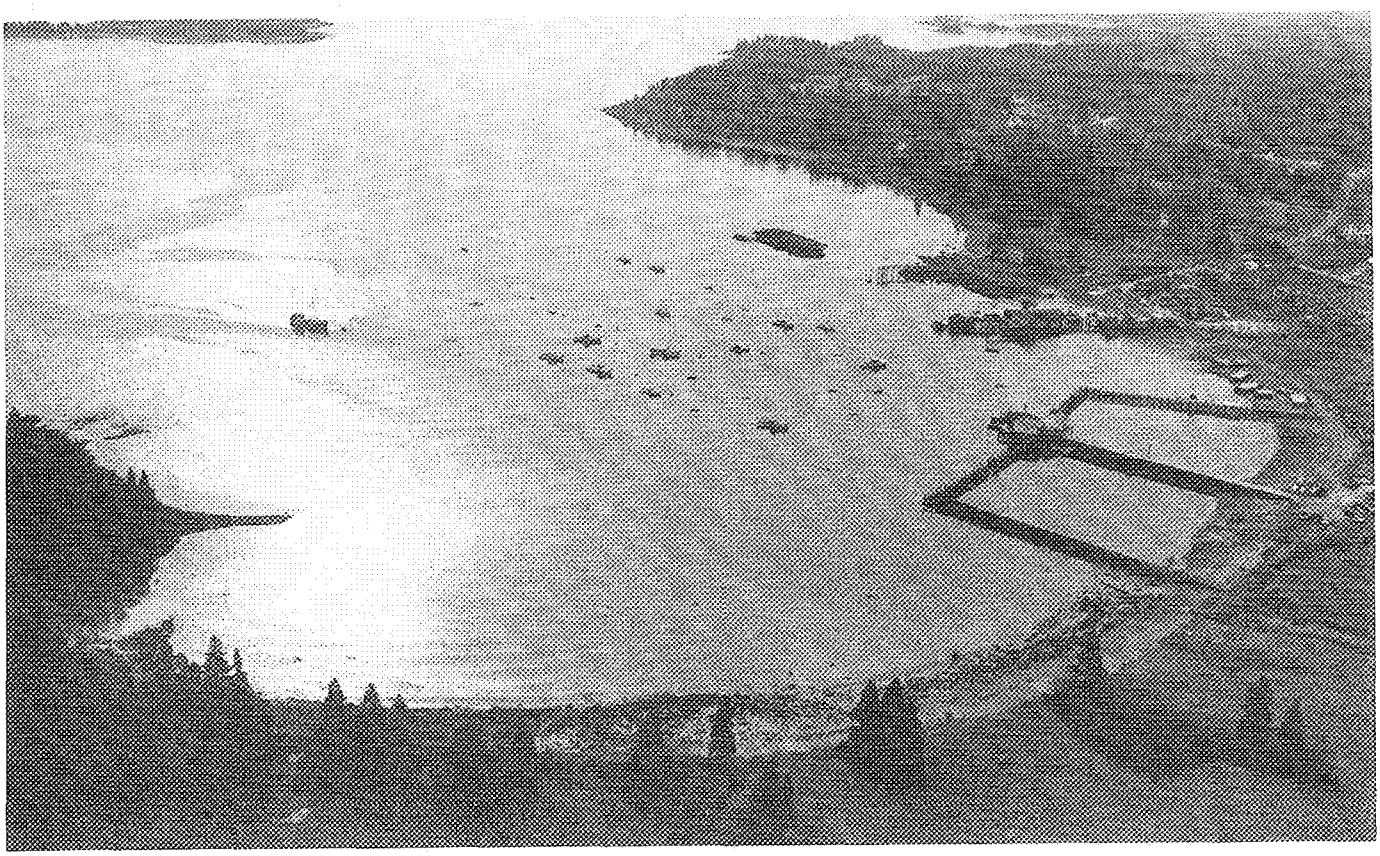
Initial work on the Penobscot River was completed in 1879 and involved dredging to a depth of 12 feet and removing obstructions in the 3.5-mile reach below Bangor. The mouth of Kenduskeag Stream in Bangor was also dredged at this time, but in 1947 this stream was declared nonnavigable and that part of the project was abandoned.

The most recent work on the Penobscot River, completed in 1913, involved:

- Deepening the natural channels at Lawrence Cove in Bucksport and Frankfurt Flats downstream of Winterport to 22 feet;
- Straightening, widening, and deepening to 15 feet the channel between Crosby Narrows in Hampden and



Northeast Harbor in Mount Desert.



Owls Head Harbor

Stearns Mill in Brewer; and

- Deepening the channel at Bangor to 14 feet. Also, about 2,000 feet of the channel along the Bangor and Brewer waterfronts was widened by an additional 100-300 feet.

Pepperell Cove

Pepperell Cove in Kittery is located at the mouth of the Piscataqua River, which forms a portion of the Maine-New Hampshire boundary. The cove services lobster and fishing fleets and a large recreational fleet. Several lobster firms are located along Chauncey Creek at the head of the cove.

The project, on the northwest side of Pepperell Cove, is a 12-foot-deep anchorage, 12.5 feet over rock, approximately 1,450 feet long and 1,250 feet wide. Work was completed in 1916.

Pig Island Gut

Pig Island Gut in Beals is the narrow passage between Pig Island and Great Wass Island, about one mile southeast of Jonesport and 30 miles east of Bar Harbor. It provides a shorter, less exposed route to the southeastern fishing grounds in Eastern Bay for commercial fishing boats based at Jonesport, Beals Harbor, Alley Bay, and in the gut itself. Used primarily by lobster boats, Pig Island Gut is also used by boats engaged in the harvesting of herring, soft shell clams, sandworms, periwinkles, mussels, and sea moss.

Pig Island Gut is a six-foot-deep channel, 80 feet wide, extending from Alley Bay to Eastern Bay. Also part of the project is a six-foot-deep anchorage, 5.5 acres in area, on the north side of the channel, south of Pig Island. Material dredged from the construction of the channel and anchorage was used to create tidal flats in Alley Bay, which now provide fishermen with an additional source of sandworms and other bait.

Completed in 1965, Pig Island Gut was constructed under Section 107 of the Continuing Authorities Program.

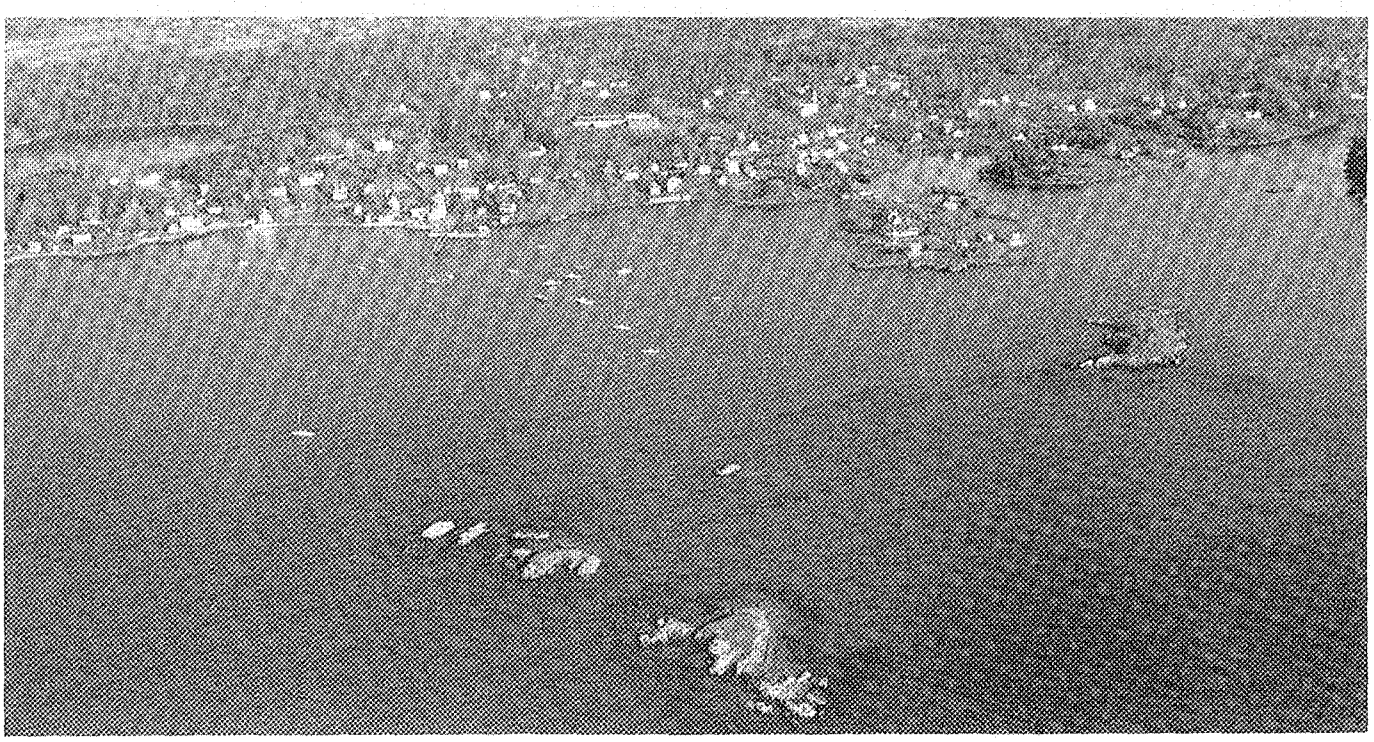
Pleasant River

The Pleasant River flows southeasterly through Columbia Falls and Addison to Pleasant Bay, about eight miles west of Jonesport. It is used by local fishing boats.

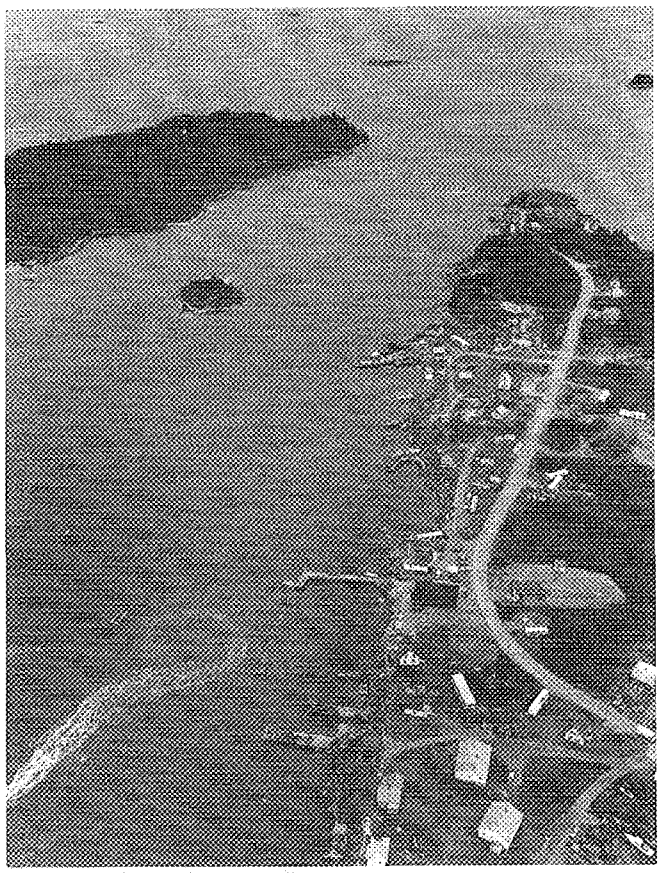
Corps' work in the river included removing boulders in the four-mile reach between Columbia Falls and Addison; installing a stone beacon to mark ledges along the channel; and installing a spindle to mark a shoal near Addison. This work was completed in 1891.

Portland Harbor

Portland Harbor, located between the cities of Portland and South Portland, is situated in Casco Bay on the southwestern coast of Maine, about 50 miles northeast of the Maine-New Hampshire border. It is strategically located, being the nearest American deepwater port to Europe, and serves as a key center for shipping by both land and sea. Imports primarily include



Pepperell Cove in Kittery.



Pig Island Gut in Beals is a narrow passage between Pig Island (left) and Great Wass Island (right). It provides commercial fishermen with a shorter route to the fishing grounds in Eastern Bay.

crude petroleum and chemicals, while exports include woodpulp and petroleum products. Portland Harbor is an important economic and commercial link to a vast territory extending northward to Canada. Rail lines and petroleum pipelines connect Portland's terminals with Quebec and Montreal.

The main harbor is located on the Fore River, which separates Portland and South Portland. A secondary harbor, used primarily by pleasure craft, is located in Back Cove, a relatively shallow cove on the north side of the peninsula, where the industrial and commercial heart of Portland is located.

Initial work in Portland Harbor took place between 1836-1874. It included construction of an eight-foot channel into Back Cove, a 20-foot channel through the Fore River entrance bar, and a breakwater on the south side of the Fore River entrance, generally parallel to the Portland waterfront. The area immediately south of the breakwater was later filled to form a major part of the South Portland waterfront.

The most recent work in Portland Harbor was completed in 1968. It consists of:

- A 9,000-foot-long entrance channel, 45 feet deep and 1,000 feet wide, extending from the southwestern end of Casco Bay (between Cushing Island and South Portland) to a point between House Island and Spring Point.
- A 45-foot-deep turning basin and anchorage, 170 acres in area, starting at the end of the 45-foot-deep entrance channel and extending for one-half mile around Spring Point.
- A three-mile-long, 35-foot-deep channel extending from the end of the 45-foot-deep turning basin and anchorage, up the Fore River and past the Portland Bridge (Route 77), and ending at a point 700 feet before Veterans Memorial Bridge (U.S. Route 1). The channel is more

Portland Harbor

than 500 feet wide at the turning basin, and gradually narrows at it approaches the Portland Bridge. From the Portland Bridge to the site of the former Vaughan Bridge (about 6,800 feet), the channel is 400 feet wide. From that point to its upstream end (500 feet), the channel is 300 feet wide.

- A 35-foot-deep turning basin on the southern side of the 35-foot-deep channel, at a point opposite Amoco Wharf, 1,000 feet downstream of Veterans Memorial Bridge.
- A 30-foot-deep anchorage, approximately one mile long, east of Fish Point. The anchorage begins at the junction of the 45-foot entrance channel and 45-foot turning basin, and bends around Fish Point toward Back Cove.
- A channel, approximately 1.2 miles long, extending from the Fish Point Anchorage to a point inside Back Cove, about 2,500 feet south of Tukey Bridge (U.S. Route 295). From the Fish Point Anchorage to the Canadian National Railroad (Grand Trunk) Bridge (a distance of about 2,500 feet), the channel is 30 feet deep and 300 feet wide. From the railroad bridge to the Tukey Bridge (1,700 feet), the channel is 14 feet deep with varying widths. From the Tukey Bridge and running along 2,500 feet of the east side of Back Cove, the channel is 12 feet deep and 300 feet wide.
- A 2,000-foot-long stone breakwater on the southerly side of the mouth of the inner harbor, near Spring Point.
- A 900-foot-long stone breakwater from Spring Point to Spring Point Ledge Lighthouse.
- The maintenance of Soldier Ledge Channel at Hussey Sound to a depth of 40 feet. The Corps originally removed two ledges that were obstructing the main channel. Hussey Sound is a passage between Peaks and Long islands, about three miles northeast of Fore River.

Portsmouth Harbor and Piscataqua River

Portsmouth Harbor is located on the Piscataqua River, which makes up a portion of the Maine-New Hampshire border. Portsmouth Harbor stretches across the communities of Kittery and Eliot, Maine, and Portsmouth, Newington, and New Castle, New Hampshire.

Located about 50 miles northeast of Boston, the harbor handles about 3.5 million tons of shipping a year for New Hampshire, eastern Vermont, and southern Maine. Items include petroleum products, iron and steel scrap, salt, limestone, and fish products. Portsmouth Harbor is used by submarines from the Portsmouth Naval Shipyard in Kittery. Known for its fast currents and sharp bends, the river is used extensively by a large lobstering fleet, local fishermen, excursion boats to the Isles of Shoals (nine miles offshore), and local and transient boats based at or visiting the nearly 20 boating facilities in the area.

Initial work in Portsmouth Harbor around the turn of the century consisted of:

- Constructing a 1,000-foot-long breakwater between Goat and New Castle islands. The breakwater now serves as a causeway for an access road to New Castle.
- Removing two ledge areas in the middle of the harbor. One area was opposite the western end of the Portsmouth Naval Shipyard, on the New Hampshire side of the channel. The second area was about 0.6 mile upstream, near the southwestern end of Badgers Island, on the Maine side of the channel.

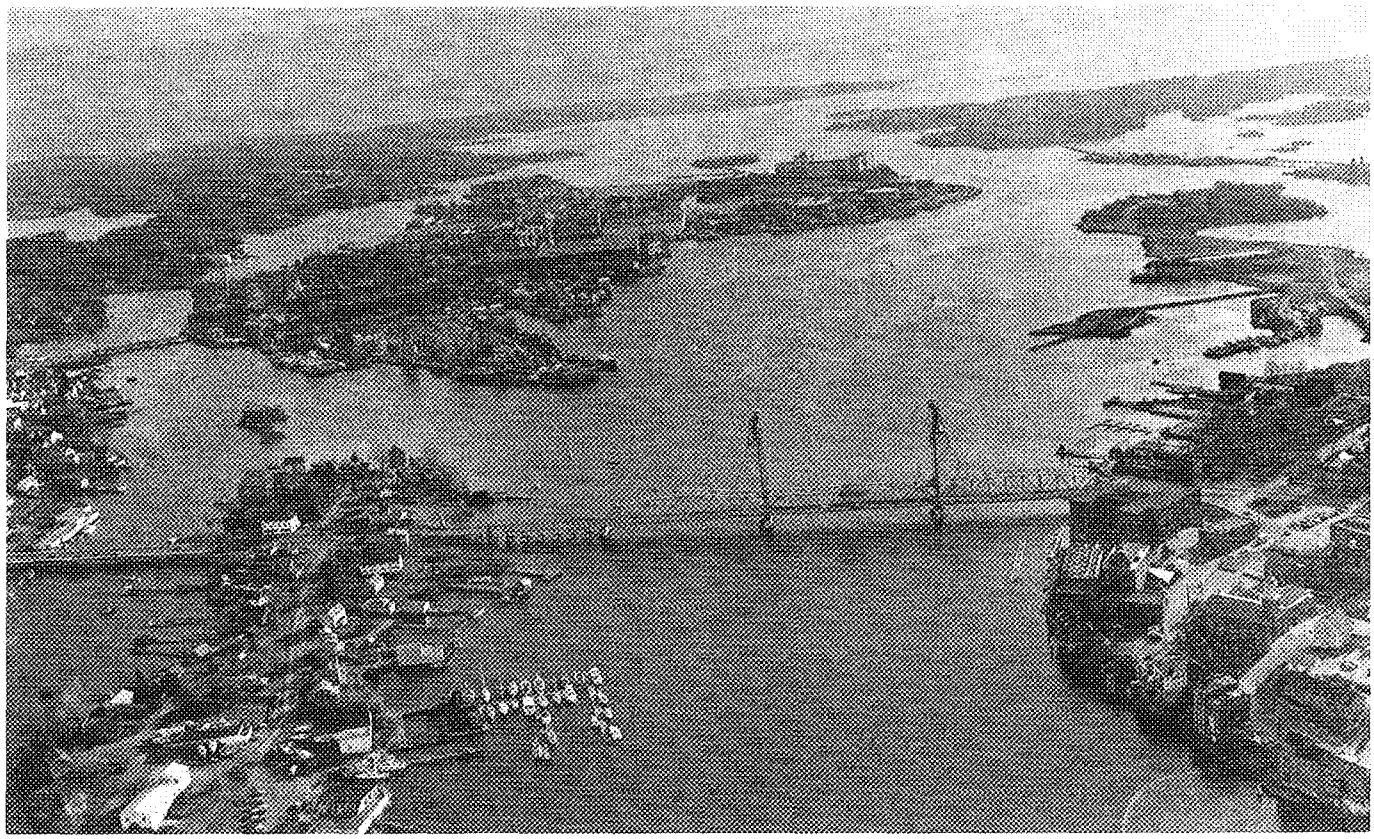
The Corps has more recently completed three projects in the harbor constructed at separate times. The first project, approved by Congress and completed in 1966, consists of:

- A 6.2-mile-long channel, 35 feet deep and generally 400-600 feet wide, extending northwesterly from deep water between New Castle and Seavey islands to a turning basin located about 1,700 feet past the Atlantic Terminal Sales dock in Newington. The bends were widened to 700 feet by removing ledge at Henderson Point, Gangway Rock, Badgers Island, the Maine-New Hampshire Interstate Bridge, and Boiling Rock.
- Two 35-foot-deep turning basins. The first turning basin is located above Boiling Rock and is 950 feet long. The second is situated at the end of the 6.2-mile-long channel in Newington and is 850 feet long.

In 1971, the Corps completed a second project, constructed under Section 107 of the Continuing Authorities Program (small projects). The work included:

- A 100-foot-wide main channel extending 0.4 mile from Little Harbor, through the Rye-New Castle drawbridge, then west to the mouth of Sagamore Creek. At this point, the channel forks into northern and western channels, described below.
- A 75-foot-wide northerly channel extending 0.7 mile between Leachs Island and Portsmouth to deep water south of Shapleigh Island.
- A 75-foot-wide westerly channel extending 0.9 mile up Sagamore Creek to the Route 1A Bridge in Rye. A six-foot-deep anchorage, three acres in area, was constructed at the upper end of the channel.

During the early 1990's major improvements were completed in Portsmouth Harbor and the Piscataqua River to include widening the maneuvering area between the two vertical lift bridges from 600 feet up to 1,000 feet; widening by 100 feet the northern limit of the channel adjacent to Badgers Island; and widening by 150 feet the southern limit of the channel at Goat Island. The first phase of the work, which included the maneuvering area and the channel adjacent to Badgers Island, was complered in July 1990 at a cost of $13.5 million. The second phase, widening the channel at Goat Island, was completed in April 1992 at a cost of $2 million.



Portsmouth Harbor. The 6.2-mile-long channel, 35 feet deep and generally 400 feet wide, was widened by removing ledge in its bends, including one at Badgers Island, just left of center in the photo.

Richmond Harbor

Richmond Harbor in Richmond is located on the west side of Swan Island, which divides the Kennebec River into two channels before they reconverge four miles upstream. A small recreational fleet is based at the harbor, which is located about 10 miles north of Bath.

In 1872, a shoal at the head of Swan Island was dredged to a depth of 10 feet. However, constant shoaling in the ensuing years diminished the effectiveness of that work. In 1883, the Corps completed additional work at Richmond Harbor. This included construction of:

- A 10-foot-deep channel at the north end of Swan Island.
- A jetty at the north end of Swan Island. The jetty constricts the flow of the stream and causes a scour effect on the channel, thereby preventing the development of sandbars.
- A 10-foot-deep channel, 100 feet wide, at Hatch's Rocks, which is located about two miles downstream of the jetty.
- An 11-foot-deep channel at the southwestern end of Swan Island.

Richmond Island Harbor

Richmond Island Harbor in Cape Elizabeth is located about 6.5 miles southwest of Portland Harbor. Richmond Island Harbor is used extensively as an anchorage by recreational craft.

The project, completed in 1881, consists of a 2,000-foot-long stone breakwater connecting Richmond Island with the mainland. The breakwater provides refuge for commercial schooners in either Richmond Island Harbor to the west of the breakwater or Seal Cove to the east, depending on the direction of the storm.

Rockland Harbor

Rockland Harbor in Rockland is located on Penobscot Bay, about 75 miles northeast of Portland. An important fishing, seafood processing, and boating center, Rockland Harbor is the mainland terminus for ferry and freight service to the Penobscot Bay Island communities of Criehaven, Matinicus, Vinalhaven, and North Haven.

The project in Rockland Harbor consists of five channels along the central waterfront with varying depths and widths, and a 4,346-foot-long stone breakwater that extends southerly from Jameson Point. The dimensions and locations of these channels are:

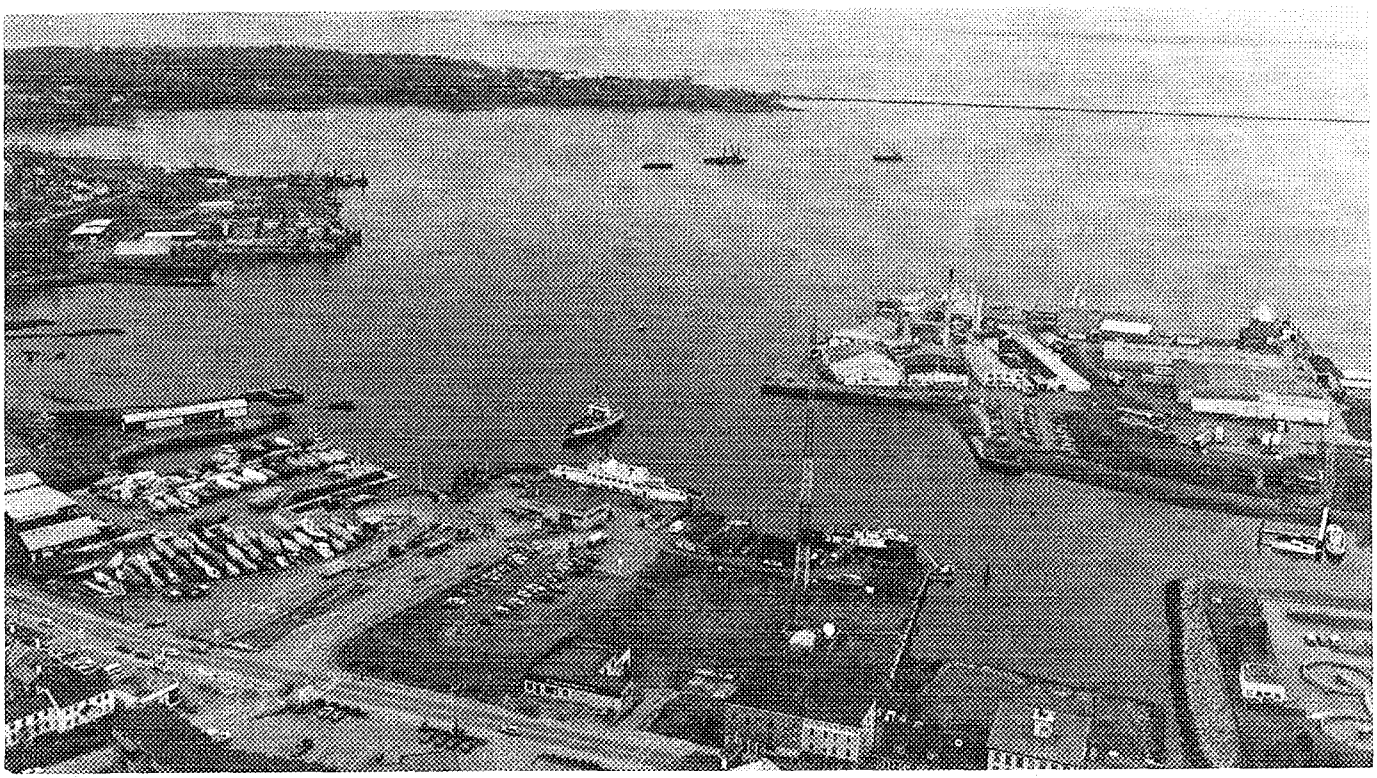
- An 18-foot-deep access channel, 200 feet wide, extending from deep water east of the U.S. Coast Guard facility to a point west of the facility.
- A 14-foot-deep channel, 150 feet wide, that begins at the end of the 18-foot-deep channel and ends at a point opposite Whitmoyer Laboratories.
- A channel 14 feet deep and 150 feet wide extending from the 18-foot-deep access channel to Lermond Cove, behind the central waterfront, in the vicinity of Schooner Dock.
- A channel 14 feet deep and 100 feet wide extending from the aforementioned 14-foot-deep channel to the vicinity of the Rockland/Rockport Lime Company.
- A channel 14 feet deep and 100 feet wide extending from the 18-foot-deep access channel to the vicinity of the E.F. Drew Company and Holmes Packing Company.

The breakwater was completed in 1904 and the channels were completed in 1959.

Rockport Harbor

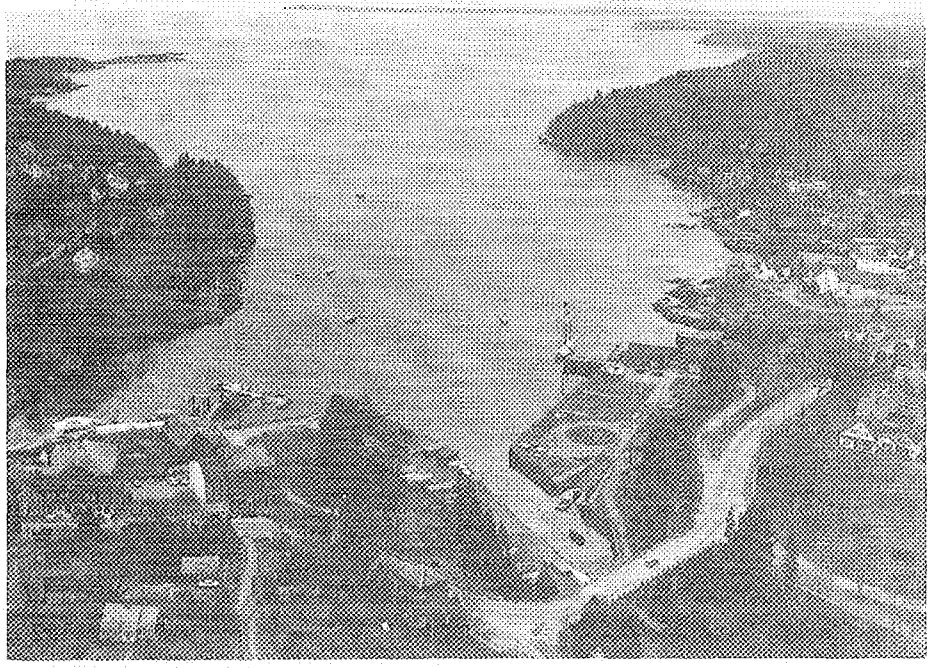
Rockport Harbor in Rockport is located in Penobscot Bay, about four miles north of Rockland Harbor and two miles south of Camden Harbor. Boat construction, boat service facilities, and charter cruises are the chief waterfront industries. A small number of commercial lobstering boats and a large recreational fleet are based at Rockport Harbor.

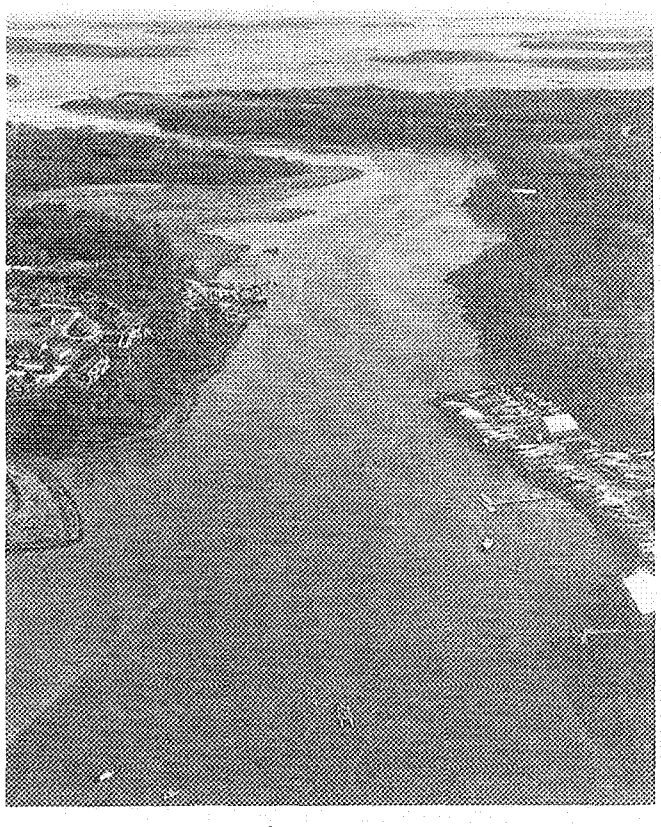
Initial work in the harbor began in 1888 when the Corps dredged an area of about 500 square feet in front of the wharves to a depth of 12 feet and removed some ledge. In 1913, the Corps removed ledge situated on the west side of the inner harbor to a depth of 15 feet, thereby widening the channel by 250 feet.



Rockland Harbor is an important fishing, seafood processing, and boating center. A major portion of the harbor's 4,300-foot-long stone breakwater can be seen extending from Jameson Point at the top.

Rockport Harbor





The Royal River in Yarmouth.

Royal River

The Royal River in Yarmouth empties into Casco Bay, about 11 miles north of Portland Harbor. It is used by fishing and recreational craft. Two boatyards and a crabmeat packing plant are located near the head of the project in Yarmouth.

Initial work on the river, completed in 1883, consisted of constructing a channel, 4.5 feet deep and 100 feet wide, to the head of commercial navigation at what is now U.S. Route 95. This included removing obstructions on the bar at Gravel Point, about 0.5 mile downstream of the present highway, and several ledges near the commercial wharves at Yarmouth. A 195-foot-long stone jetty was constructed on the river's south bank, opposite Wolfe's Point, about 0.8 mile from its mouth.

In 1967, the Corps completed additional work in the harbor under Section 107 of the Continuing Authorities Program. It consisted of an eight-foot-deep channel, 80 feet wide, extending about three miles from the deep water in Casco Bay to the commercial wharves at Yarmouth; and a six-foot-deep anchorage, eight acres in area, at the wharves.

Saco River

The Saco River originates in New Hampshire's White Mountains and flows southeasterly through Maine for about 105 miles, emptying into Saco Bay at a point about 16 miles south of Portland Harbor. The river's last six miles, which flow between the coastal cities of Biddeford and Saco, represent the area where the Corps has made several navigational improvements. Most of the fishing fleet in the area is based at Camp Ellis Harbor in Saco, about one mile upstream of the river entrance, and most of the recreational fleet is based upstream in Biddeford and Saco.

Initial work in the river began in the 1800s. More recently, the Corps has made three series of navigational improvements to the river, constructed at different times. The first improvements, completed in 1938, consist of:

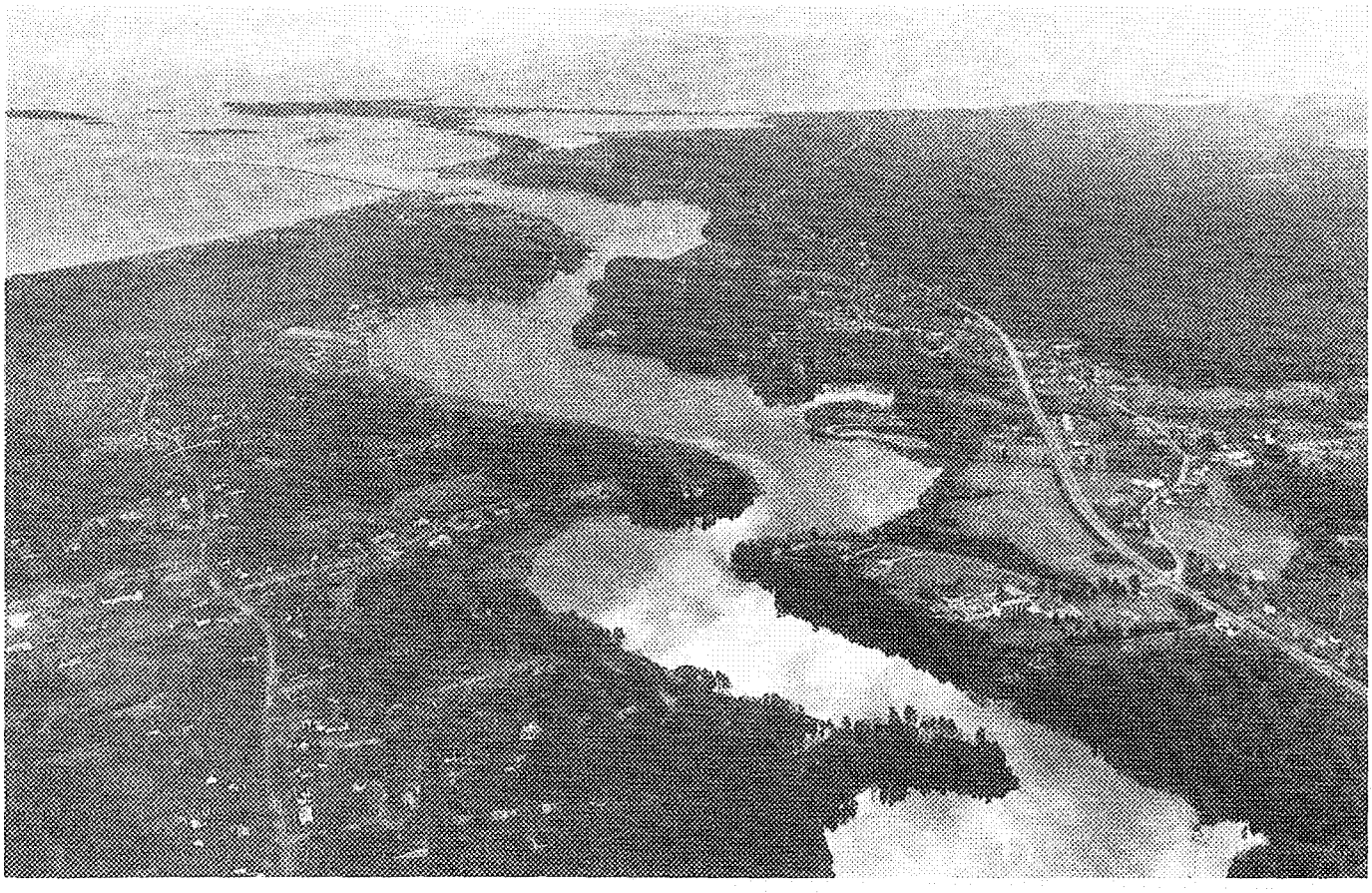
- A six-mile-long channel, eight feet deep (nine feet deep over ledge) with widths varying from 100-200 feet, extending from the sea to Half-Tide Island, between Biddeford and Saco;
- Three small stone jetties along the river, located at Chase Point (across from Moors Brook), Junkins Point, and Half-Tide Island;
- A 6,600-foot-long breakwater at the entrance to the river, extending seaward from Ferry Beach in Saco;
- A 4,800-foot-long stone jetty at the entrance to the river, extending seaward from Hills Beach in Biddeford and parallel to the breakwater; and
- The excavation of a small amount of rock.

In 1969, the Corps constructed a second series of navigation improvements on the Saco River. These improvements were constructed under Section 107 of the Continuing Authorities Program. They included:

- Two six-foot-deep anchorages at Camp Ellis Harbor, on either side of the six-mile channel, totalling 10.5 acres in area; and
- A six-foot-deep turning basin, 10 acres in area, at Half-Tide Island.

The third set of improvements was completed at Camp Ellis Harbor in 1983, also under Section 107 of the Continuing Authorities Program. They included:

- The construction of a six-foot-deep anchorage, three acres in area, located immediately east of the city pier; and
- The construction of 13 icebreakers to deflect the flow of ice originating upstream. Ice flows moving down the Saco River had caused considerable damage to the state pier and fishing vessels moored in the harbor. The extent of damage to vessels ranged from splintering to cutting and sinking, forcing most fisherman to haul their boats ashore for the winter or relocate to another harbor during



The Saco River flows through Maine for 105 miles before emptying into the Atlantic Ocean. The river's last six miles flow between Biddeford and Saco.

the winter months at considerable expense. Built by the Corps on an experimental basis, the icebreakers have successfully prevented further damage to the pier and fishing craft by deflecting ice away from the harbor. Consisting of two-foot-diameter steel columns filled with sand and capped with concrete, the icebreakers are driven into the river bed. They have reflectors for safety purposes. Eleven icebreakers were constructed to protect craft moored at the six-foot-deep anchorage east of the city pier, and two were built to safeguard the state pier and vessels unloading at the pier. One of the 11 icebreakers protecting the anchorage has a platform for osprey nesting.

Sand dredged from the entrance channel and the anchorages has been used to nourish the beaches adjacent to the river entrance.

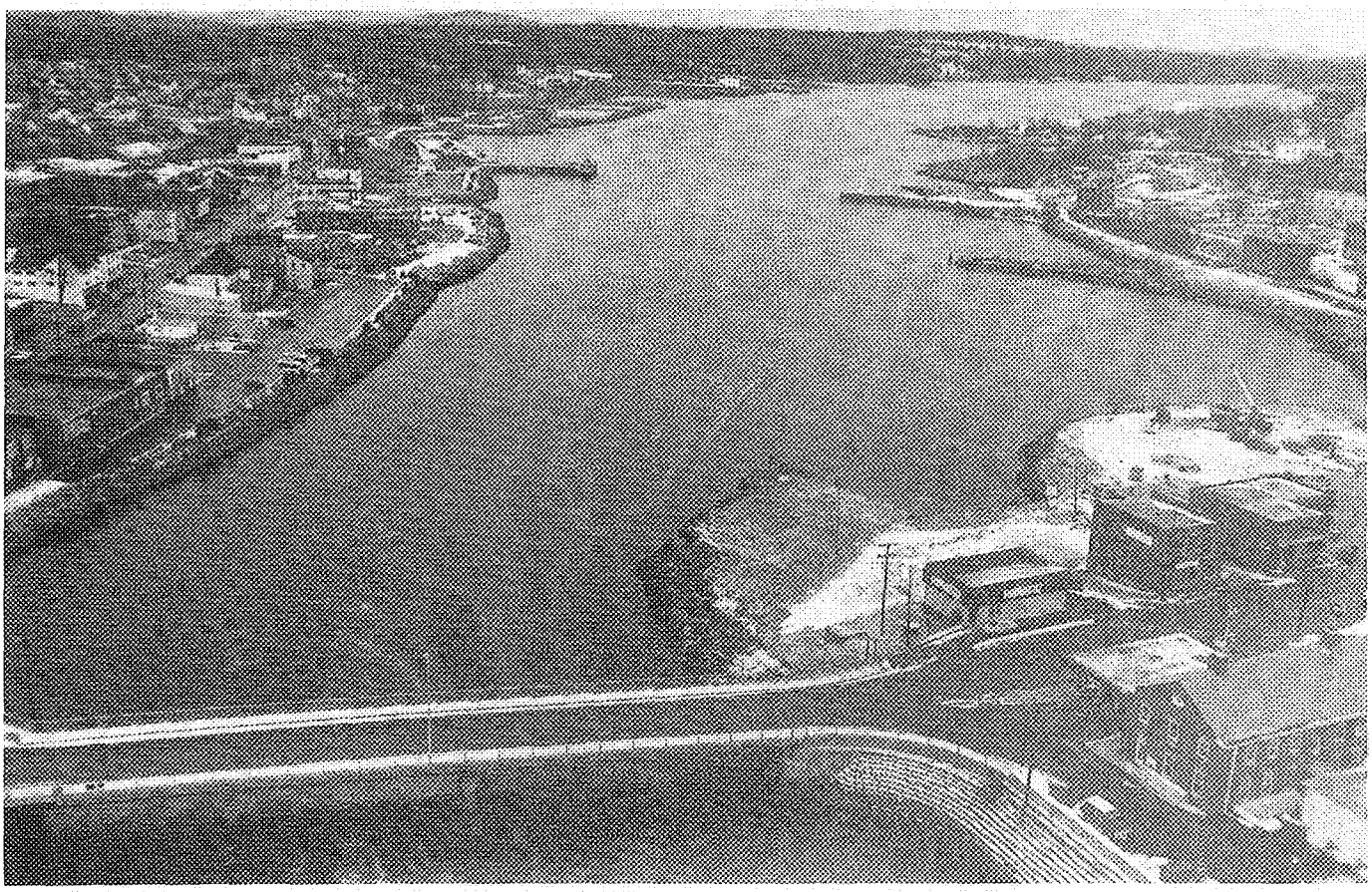
Saint Croix River

The Saint Croix River rises from East Grand Lake at Forest City and flows southeasterly for 92 miles before emptying into Passamaquoddy Bay. Throughout its entire length, the river forms the easternmost part of the international boundary between the United States and Canada. For its last several miles, the river forms the boundary between Calais and St. Stephen, New Brunswick. The Saint Croix River is used by commercial fishermen from both nations.

Initial work on the river was completed in 1856. It involved construction of three piers to keep vessels away from a ledge opposite Mark Point Lighthouse, located about five miles downstream of Calais on the American side of the waterway.

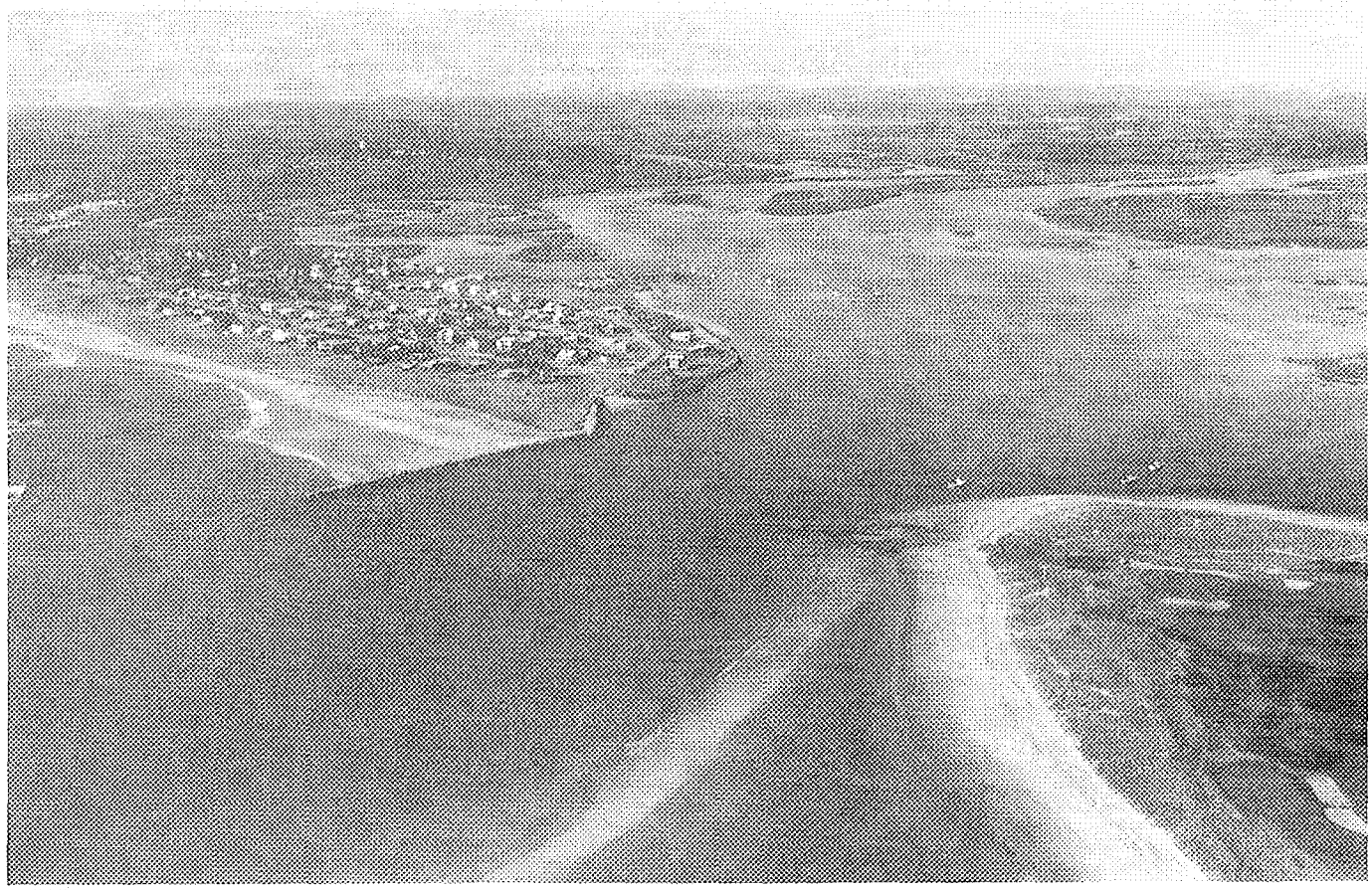
The present project, completed in 1916, consists of:

- Repair of the piers.
- A 3.7-mile-long channel with varying dimensions extending from Hills Point at The Narrows to the Upper Steamboat Wharf near the International Bridge, which connects Calais and St. Stephen. From The Narrows to the Lower Steamboat Wharf at Calais, a distance of nearly two miles, the channel is 12 feet deep and 200 feet wide. From the Lower Steamboat Wharf to the public landing at St. Stephen, a distance of 1.5 miles, the channel is nine feet deep and 150 feet wide. From the public landing at Saint Stephen to the Upper Steamboat Wharf near the International Bridge, a distance of 2,000 feet, it is nine feet deep and 100 feet wide.



The Saint Croix River in Calais.

The one-mile-long channel on the Saint George River extends from deep water (at the top of the photo) to Thomaston Harbor (bottom center).



The Scarborough River empties into Saco Bay at Pine Point Harbor. The jetty at the river entrance is 800 feet long.

Saint George River

The Saint George River empties into Thomaston Harbor in Thomaston, located about four miles southwest of Rockland and 11 miles northeast of Muscongus Bay. Both the harbor and river are used by recreational boaters, windjammer cruise vessels, and boat construction firms. The several deep coves along the lower reaches of the river are home to a number of commercial lobstering boats.

The project, completed in 1903, consists of a channel extending about one mile upstream from deep water in the Saint George River in Thomaston to Thomaston Harbor. The channel is 16 feet deep and has a width that varies between 90-220 feet.

Sasanoa River

The Sasanoa River is about 11 miles in length and connects the Kennebec River at Bath with the Sheepscot River at Westport. The Corps project centers around a 0.5-mile-long stretch of the river at the northeastern end of Arrowsic Island in Arrowsic and south of Woolwich.

Known as Upper Hell Gate, this half-mile stretch was originally constricted by curves and ledges and made more dangerous by swift currents. The Corps' initial improvement of the waterway, completed in 1898, provided for the removal of various ledge areas, giving the channel a minimum width of 90 feet.

In 1908, the Corps completed additional work in the river. This consisted of widening the channel to a minimum of 140 feet and deepening it to 12 feet by cutting through ledges at Upper Hell Gate and removing Flat Rock to the east. The Corps also removed rock and sunken ledges and built a small jetty on the northeastern side of Arrowsic Island, about 0.5 mile from Upper Hell Gate.

The project has reduced the velocity of the current and allowed larger vessels to make the journey between Bath and Boothbay Harbor via a shorter and more protected route.

Scarborough River

The Scarborough River in Scarborough empties into Pine Point Harbor at Saco Bay, between the Pine Point and Prouts Neck sections of the town, situated about eight miles south of Portland. Pine Point Harbor is the year-round home to a commercial fishing fleet and seasonal port to recreational vessels. Old Orchard Beach, a popular summer resort area, is a short distance south of Pine Point.

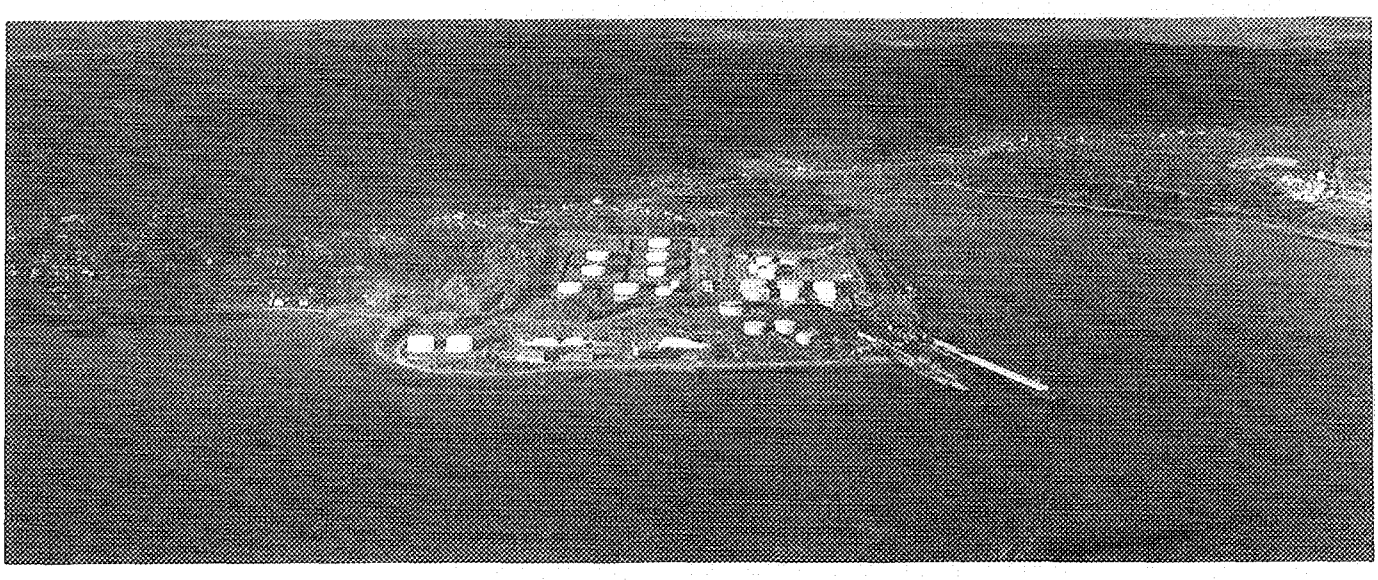
Completed in 1962, the project consists of:

- A 2,400-foot-long channel with varying dimensions extending from deep water to an area adjacent to Jones Creek, about 0.5 miles upstream of Pine Point. From deep water to an area several hundred feet from Pine Point, the channel is eight feet deep and 200 feet wide. From this point to the area adjacent to Jones Creek, the channel is six feet deep and 100 feet wide.
- A six-foot-deep anchorage at the end of the channel, adjacent to Jones Creek and the Pine Point public landing. The anchorage is 1,350 feet long and 300 feet wide.
- An 800-foot-long jetty extending seaward from Pine Point.

Disposal of the dredged material from this project provided the fill for much of the Pine Point section of Scarborough that was later developed.

Searsport Harbor

Searsport Harbor in Searsport is located on Penobscot Bay, about four miles northeast of Belfast Harbor and 26 miles north of Rockland Harbor. The harbor is used principally for the receipt of petroleum products and salt, and the export of lumber, paper, and much of Aroostook County's annual potato crop.



Searsport Harbor

The project, completed in 1964, consists of an access channel, 35 feet deep and 500 feet wide, west of Sears Island; and a 35-foot-deep turning basin extending from the end of the access channel to the piers at Mack Point. The turning basin has a maximum width of 1,500 feet.

South Bristol Harbor

South Bristol Harbor in South Bristol is located between Bristol Neck and Rutherford Island, along the narrow passage known as "The Gut" that connects the Damariscotta River to the west and Johns Bay to the east. The harbor is 40 miles northeast of Portland and about 14 miles southeast of Bath. The business section and commercial fishing center of South Bristol are located along both sides of the harbor. A boatbuilding firm, seasonal passenger vessels and a small recreational fleet also utilize the waterway.

Work in South Bristol Harbor was completed in two stages. In 1914, the Corps removed obstructing ledges to a depth of two feet through the drawbridge (replaced by a swing bridge in 1930) on Route 129. In 1963, the Corps constructed a six-foot-deep channel through the swing bridge. The channel has a width of 50 feet on the Johns Bay side of the bridge, narrowing to 20 feet under the bridge, widening again to 50 feet as it extends southwesterly toward the Damariscotta River.

Southwest Harbor

Southwest Harbor, in the town of Southwest Harbor, is a large cove indenting the southeast side of Mount Desert Island at Clark Point, about 13 miles southwest of Bar Harbor. Lying at the entrance to Somes Sound, which bisects the southern half of the island, Southwest Harbor is a boatbuilding center and is used by fishing and large recreational fleets. A U.S. Coast Guard base is located on Clark Point.

Completed in 1962, the project provides for two adjoining anchorage areas of about five acres each on the north side of the harbor near the wharves, west of Clark Point. The outer anchorage is 10 feet deep, and the inner anchorage, near Tracy Cove, is six feet deep.

Stockton Harbor

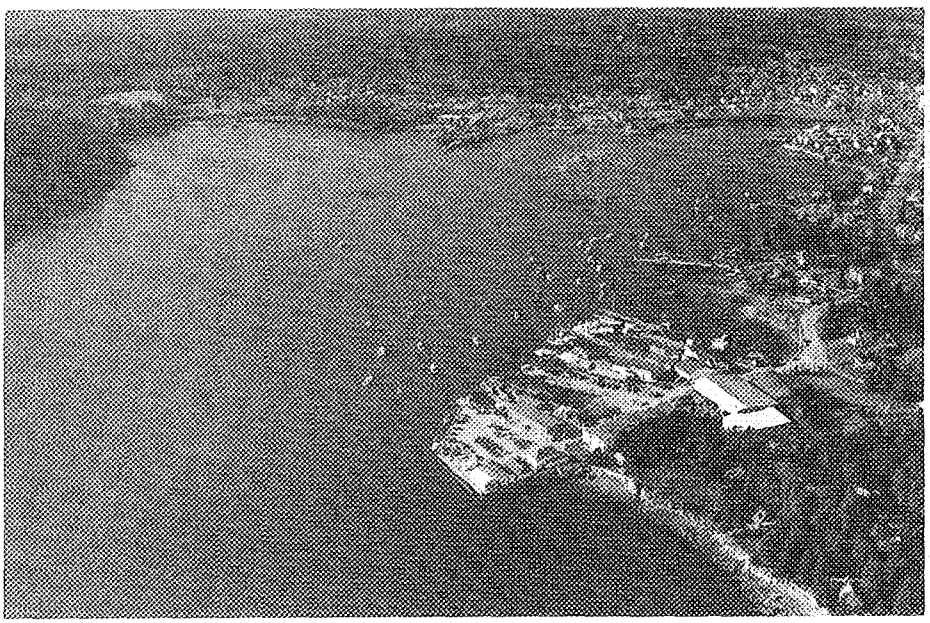
Stockton Harbor in Stockton Springs is situated at the head of Penobscot Bay, between Cape Jellison and Sears Island, about two miles northeast of Searsport Harbor and 27 miles northeast of Rockland Harbor. The harbor is used by recreational boaters.

The project consists of a 25-foot-deep channel, 300 feet wide, beginning in an area on the east side of the harbor between Sears Island and Cape Jellison and extending 3,600 feet to a point opposite the Bangor and Aroostook Railroad Line. The channel was completed in 1911.

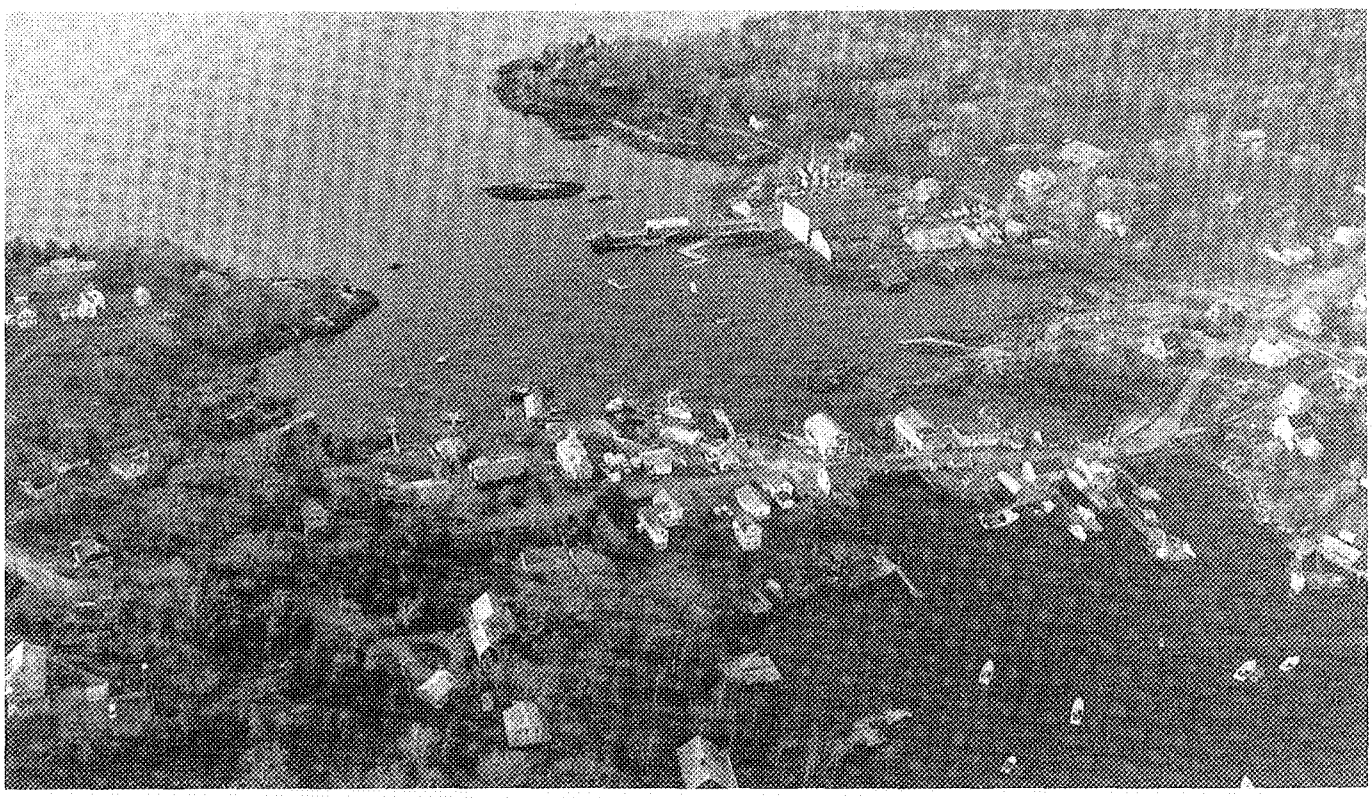
Stonington Harbor

Stonington Harbor in Deer Isle is located on Penobscot Bay, about 22 miles northeast of Rockland. It is home to one of Maine's most productive fishing ports, and capitalizes on its proximity to the inshore and offshore fishing grounds of the Atlantic Ocean. Major industries include fishing, sardine canning, quarrying, boat construction, and other marine-related activities.

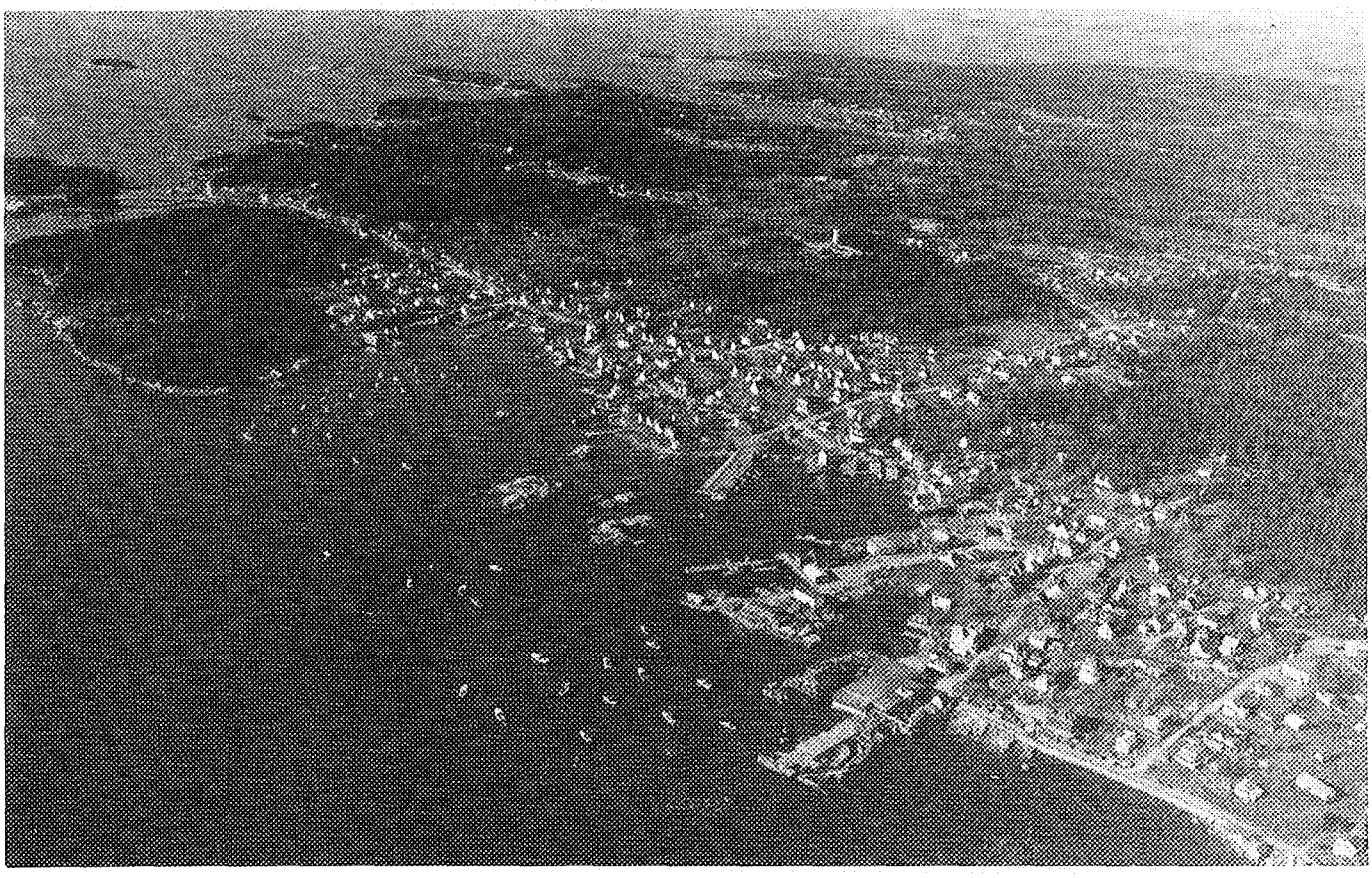
The project consists of an 800-foot-long channel extending from deep water in Deer Isle Thoroughfare to the town wharves and state fish pier, and an anchorage in the area of Green Head. The channel has a depth of 10 feet and is 100 feet wide for its outer 525 feet, then narrows to 60 feet wide for its remaining 275 feet. The anchorage is 10 acres in area; the outer three acres have depths of eight feet, while the inner seven acres have depths of six feet.



Southwest Harbor



South Bristol Harbor in Bristol. The Corps' project is a six-foot-deep channel from Johns Bay in the lower half of the photo, extending underneath the bridge, to the Damariscotta River in the upper half of the photo.



Stonington Harbor in Deer Isle.

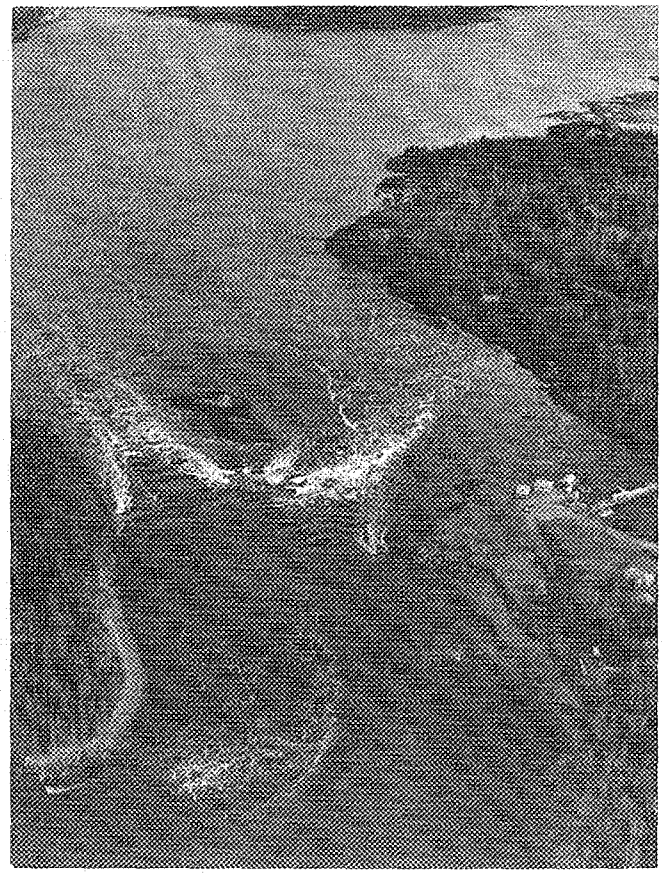
The project provides more efficient access to the port for the larger offshore fishing vessels and increases the harbor's capability to attract new vessels. Completed in 1984, the work at Stonington Harbor was constructed under Section 107 of the Continuing Authorities Program.

Sullivan Falls Harbor

Sullivan Falls Harbor lies between Sullivan and Hancock and is situated on the Sullivan River at the northern end of Sullivan Harbor, which is the middle of three inlets at the head of Frenchman Bay. Sullivan Falls Harbor is about nine miles north of Bar Harbor. The falls are formed by tidal currents passing over obstructing ledges at the head of Frenchman Bay. At the turn of the century, the Sullivan River was used principally for the shipment of quarry stone from West Sullivan, about one mile upstream of the falls. Today it is used on a limited basis by lobstering and recreational boats.

Original work in the harbor, completed in 1875, consisted of removing three abandoned piers at West Sullivan (about 0.5 mile above the falls), excavating obstructing ledges at the falls to a depth of seven feet, and replacing spindles on rocks at the mouth of the Sullivan River.

Additional work in the harbor was completed in 1914. This included removing Hatchers Rock and two ledges off Falls Point in Sullivan to a depth of 10 feet in the navigable channel off the Sullivan waterfront.



The falls at Sullivan Falls Harbor in Sullivan are formed by tidal currents passing over obstructing ledges.

Tenants Harbor

Tenants Harbor in Saint George is located about 12 miles southwest of Rockland Harbor. Primarily a lobster port, the harbor is also utilized by recreational craft.

Corps work in the harbor consists of a 1,100-foot-long channel, 15 feet deep and 280 feet wide, extending westerly from a natural 15-foot depth in the harbor to a point immediately past Steamboat Wharf. The project was completed in 1919.

Union River

The Union River flows southerly from Graham Lake, through Ellsworth, to Union River Bay, which is one of four northern arms of Blue Hill Bay and is located about 12 miles northwest of Bar Harbor. The use of the waterway from Ellsworth to Blue Hill Bay is limited to small recreational boats and a modest number of lobster boats.

Initial work in a 3.75-mile reach of the river, from the head of Union River Bay to Ellsworth, was completed in 1873 when the Corps removed sunken ledges, boulders, and sawdust. This gave the channel a depth of three feet and a width of 150 feet. The Corps also placed a spindle on the outer extremity of a sunken ledge at Fullerton Point.

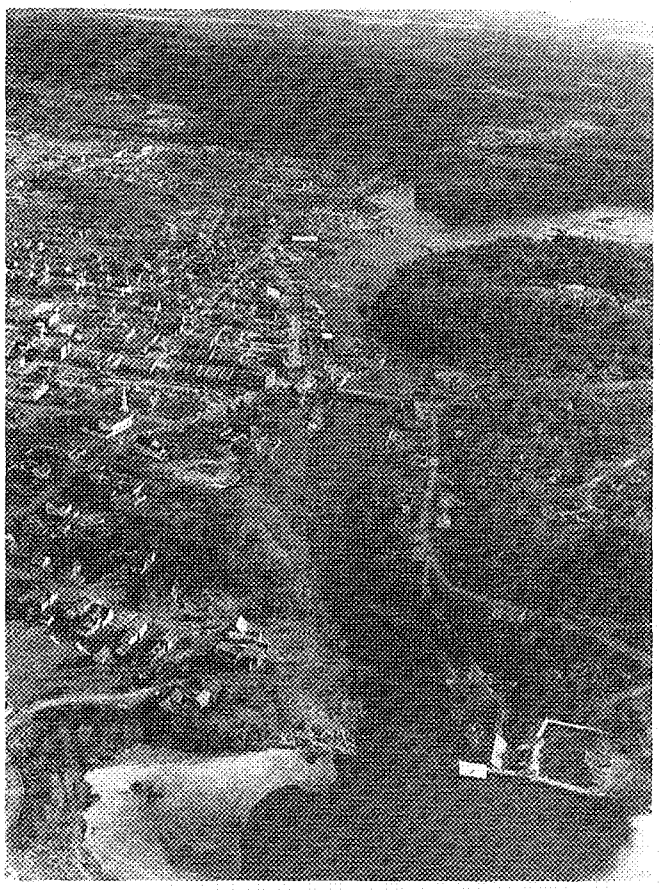
The existing project, completed in 1911, involved removing additional ledges and boulders in the reach from Union River Bay to Ellsworth. This provided the channel with a depth of six feet and a width of 120-200 feet. Obstructions in the river were also removed, giving that section of the channel a depth of four feet.

Wells Harbor

Wells Harbor in Wells is located at the mouth of the Webhannet River, 20 miles south of Portland. The protected harbor is home to small recreational and fishing fleets.

Original work in Wells Harbor began in 1835, when a 750-foot-long wooden pier was constructed on Drakes Island at the northern entrance point to the harbor. Repaired in 1873, only the pilings remain today. The existing project, completed in 1967, includes:

- An eight-foot-deep entrance channel, 100 feet wide, extending 3,000 feet from deep water in the Atlantic Ocean to a point opposite the northern end of Wells Beach.
- A six-foot-deep inner channel that starts at the end of the eight-foot-deep channel and turns southerly toward the protected harbor and town landing behind Wells Beach, ending about 700 feet south of the town landing. The channel is 150 feet wide, but narrows to 100 feet as it turns southerly.
- A six-foot-deep anchorage, 7.4 acres in area, parallel to the inner harbor channel opposite the town landing.



The Union River in Ellsworth.

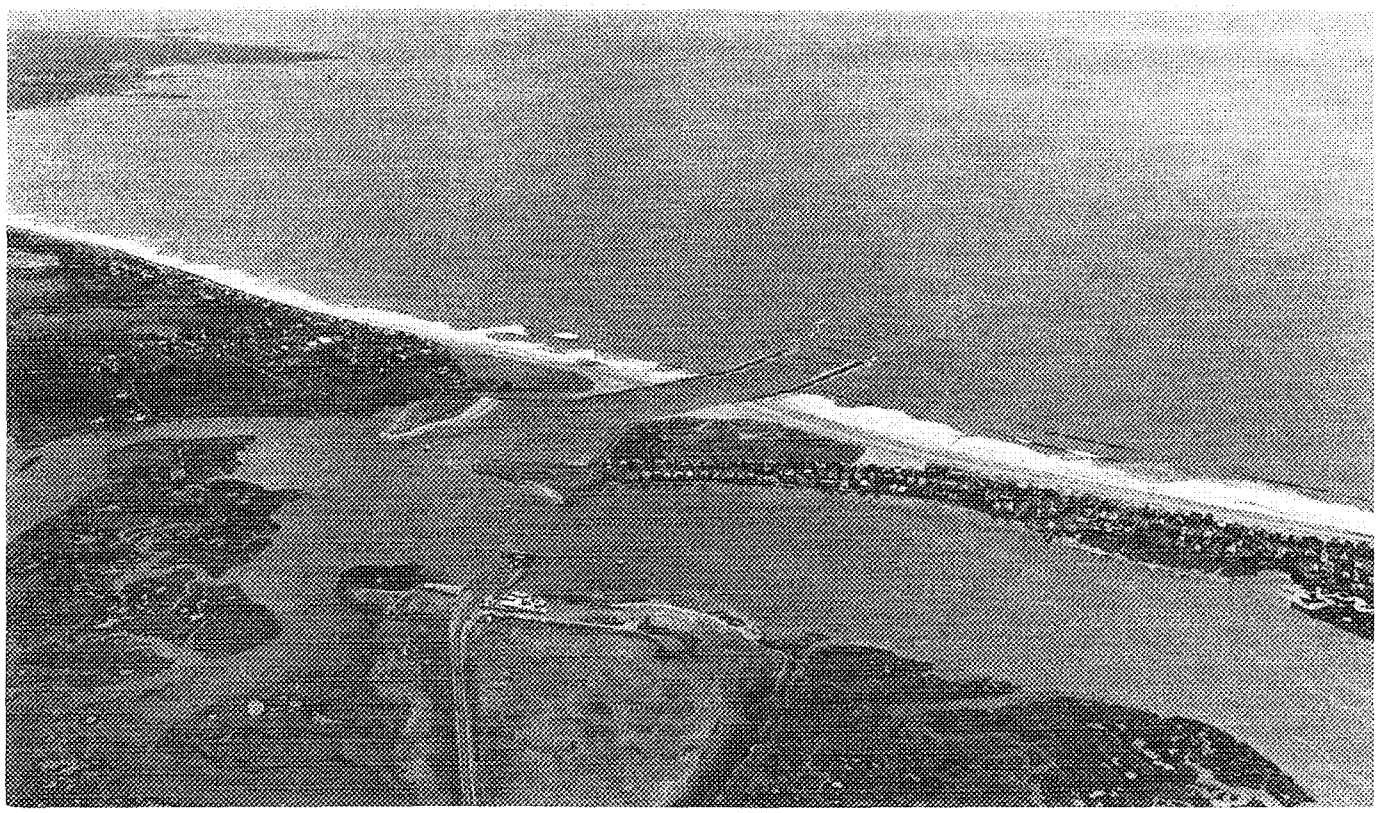
- A 10-foot-deep settling basin immediately south of the six-foot-deep anchorage and inner channel. A settling basin is an area dredged to reduce the effects of shoaling.
- Two parallel stone jetties at the harbor entrance that create an opening 400 feet wide. The north jetty extends 2,065 feet southeasterly from Drakes Island, and the south jetty extends 2,240 feet easterly from Wells Beach.
- A revetment at the northern tip of Wells Beach. Work also included sand replenishment.

Some of the sand dredged from the harbor during initial construction and subsequent maintenance has been used to replenish and nourish Wells Beach and other nearby beaches.

Winter Harbor

Winter Harbor, in the town of Winter Harbor, is a small, protected harbor on the west side of Schoodic Peninsula in Blue Hill Bay, about six miles east of Bar Harbor. Winter Harbor consists of a large outer harbor, which is enclosed on the west by Grindstone Neck, and three smaller coves along its northern side - Henry Cove, Inner Harbor, and Sand Cove. Inner Harbor, which is situated between Guptill and Harbor points, is used principally by commercial fishing boats.

In 1975, the Corps completed construction of an eight-foot-deep anchorage, 75 feet wide and 6.5 acres in area, extending about 1,200 feet from the entrance of Inner Harbor to the Fisherman's Cooperative Wharf. The work was constructed under Section 107 of the Continuing Authorities Program.



Wells Harbor

Wood Island Harbor and Biddeford Pool

Wood Island Harbor in Biddeford is located in Saco Bay, about 20 miles southwest of Portland Harbor. Biddeford Pool, also in Biddeford, is located about 0.5 miles southwest of Wood Island Harbor and can be reached through "The Gut," a deep, narrow passage between Fort Hill Point on the north and Fletcher Neck to the south. Wood Island Harbor is a popular yachting center and is utilized by recreational and commercial fishing boats.

The project was constructed in Biddeford Pool in 1956. It consists of a six-foot-deep anchorage basin, 9.7 acres in area, directly south of "The Gut" and three stone icebreakers off Fisherman's Wharf on Fletcher Neck.

The project was modified under the provisions of the Section 107 Small Projects Authority to provide for an entrance channel 4,200 feet long, 100 feet wide, and 10 feet deep from deep water in Wood Island Harbor to a point just inside "The Gut." Dredging was completed in 1992.

York Harbor

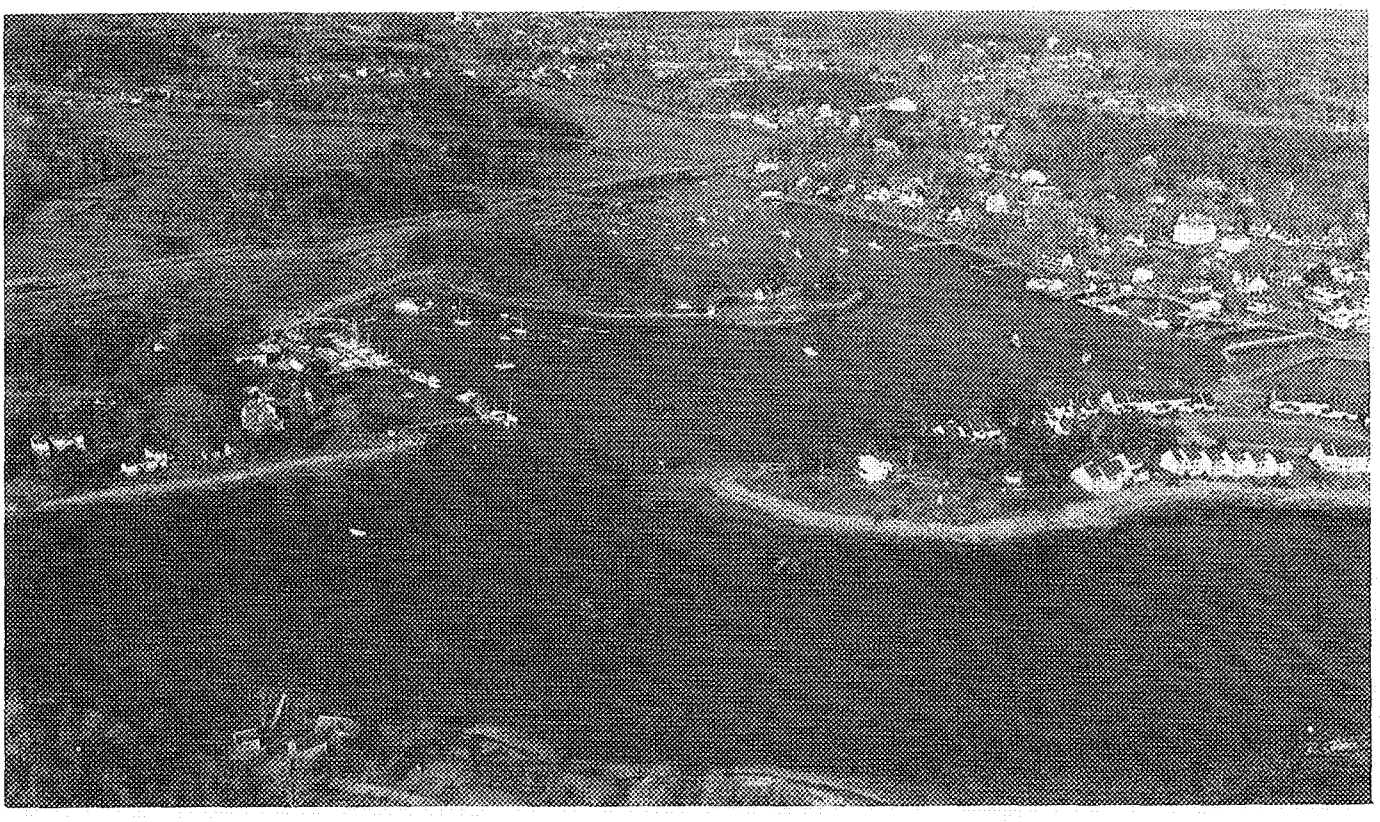
York Harbor in York lies at the mouth of the York River, a small stream that empties into the Atlantic Ocean. The harbor is located about 41 miles southwest of Portland and eight miles northeast of Portsmouth, New Hampshire. A popular overnight stop for transient recreational boats, York Harbor is used extensively by local lobstering, sportfishing, and recreational fleets, as well as fishing and recreational charter boats.

The original project, completed in 1894, involved widening and straightening the channel by removing part of the spit at the southwestern end of Stage Neck, which protects the inner harbor from the exposed outer harbor. The Corps also removed two shoals in the area of Bragdon Island.

The Corps has since completed two series of modifications to York Harbor. The first improvements, completed in 1905, involved:

- Widening the natural channel east of Bragdon Island in the inner harbor to 170 feet with a depth of 10 feet; and
- Removing a projecting shoal in the natural channel north of Bragdon Island to a depth of 10 feet.

In 1961, the Corps completed its second series of modifications in the harbor, which involved the construction of two eight-foot-deep anchorage areas. One anchorage, north of Bragdon Island, is 5.2 acres in area and averages a length of 700 feet and a width of 320 feet. The second anchorage, between Bragdon and Harris islands, is 5.6 acres in area and averages a length of 550 feet and a width of 450 feet.



York Harbor

Shore and Bank Protection

As New England's iargest state, Maine has the region's longest shoreline and the largest number of miles in its rivers and streams.

Maine has approximately 2,500 miles of irregular shaped coves, bays, and beaches. Of this number, 60 miles are publicly-owned beach and 20 miles are owned by the federal Government. The remaining 2,410 miles are privately owned. The northern two-thirds of shoreline (from the Kennebec River northward) is generally rocky and less developed. The southern third of the state has the majority of recreational beaches and is more densely populated. Maine has 31,672 miles of rivers and streams.

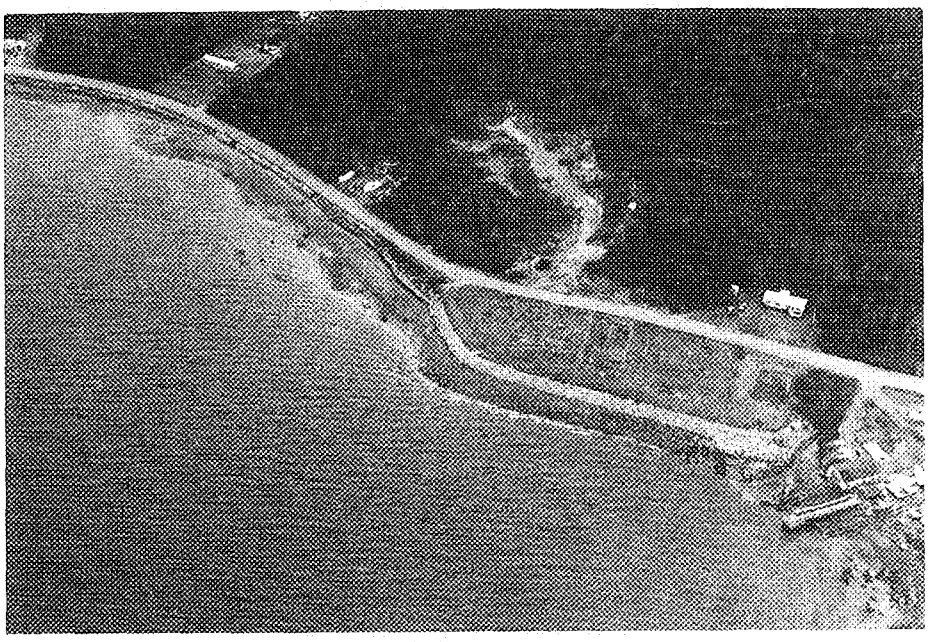
The Corps has constructed 16 shore and bank protection projects in Maine to stem erosion of the shoreline and riverbanks. Total construction costs amount to $1.8 million.

The following pages describe the Corps' shore and bank protection projects in Maine.

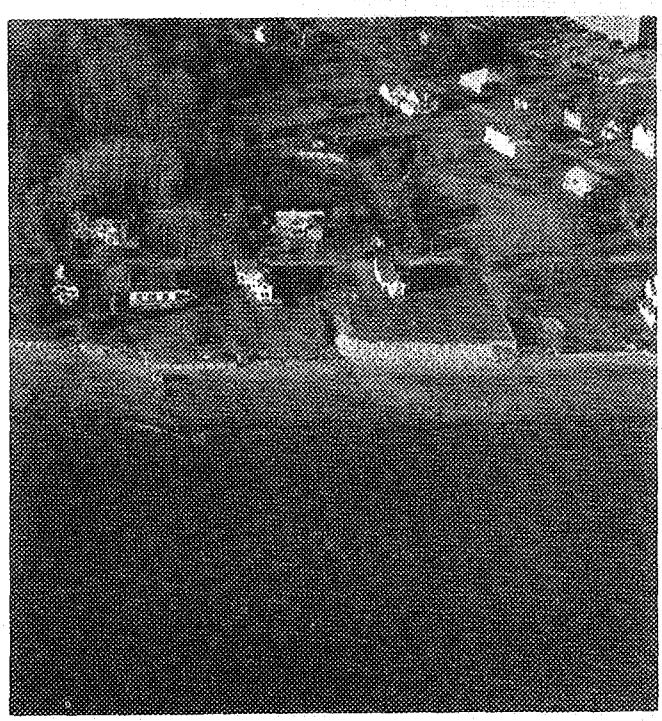
The shore can take a beating from storm driven winds and waves. In September 1961, Hurricane Esther raised havoc with Rhode Island's Narragansett Pier, slamming waves against the seawall and flooding adjacent streets. (Copyright 1961 The Providence Journal Company).

Shore and Bank Protection Projects

Alley Bay, Beals
Bagaduce River, Castine
Holmes Bay, Whiting
Islesboro (The Narrows)
Johnson Bay, Lubec
Little River, Belfast
Machias River, Machias
Machias River, Machiasport
Marginal Way, Ogunquit
Merriconeag Sound, Harpswell
Narraguagus River, Milbridge
Perley Brook, Fort Kent
Pleasant Point, Perry
Prestile Stream, Blaine
Roosevelt Campobello/International Park
Canada
Sand Cove, Gouldsboro



The Alley Bay project in Beals strengthens the eroded shoreline and protects about 40 graves in the Sewall Field Cemetery.



The Bagaduce River shore protection project in Castine, which protects the archaeological remains at historic Fort Pentagoet, includes about 200 feet of stone slope protection along the shoreline and a stone wall along the north side of the Fort.

Alley Bay, Beals

The Alley Bay project lies on the northeastern shore of Beals Island in Beals, adjacent to Alley Bay, off the coast of "Downeast Maine" opposite Jonesport. Beals Island is approximately 40 miles southwest of Eastport.

The tides and wave action of Alley Bay had caused severe erosion of the shoreline and endangered about 40 graves in the Sewall Field Cemetery. The project involved placing stone slope protection along approximately 530 feet of eroded shoreline to strengthen it and protect the cemetery.

Construction of the project began in October 1978 and was completed in January 1979 at a cost of $190,500. It was built under Section 14 of the Corps' Continuing Authorities Program.

Bagaduce River, Castine

The project on the Bagaduce River in Castine is located at historic Fort Pentagoet, near Castine Harbor and less than 0.5 mile southwest of the town center. Castine is about 30 miles south of Bangor and 10 miles east of Belfast.

Erosion along 200 feet of shoreline was threatening to destroy the important archaeological remains of Fort Pentagoet. To stem this erosion, the Corps erected a stone wall and placed about 200 feet of stone slope protection along the shoreline.

Construction began in October 1983 and was completed in May 1984 at a cost of $129,500. It was built under Section 14 of the Corps' Continuing Authorities Program.

Holmes Bay, Whiting

The project on Holmes Bay in Whiting is located adjacent to Route 191, a coastal access road that runs parallel to the bay. Holmes Bay lies midway between Jonesport and Eastport.

In August 1962, a significant earthslide occurred on a section of Holmes Bay shoreline weakened from erosion caused by severe storms. The earthslide came within 40 feet of Route 191. Another earthslide occurred in 1977. To help protect Route 191, the Corps placed stone slope protection along 600 feet of the eroded shoreline.

Situated in the central portion of Islesboro in a 500-foot-wide area known as "The Narrows," the Islesboro bank protection project helps to stabilize Main Road, the only road connecting both halves of the island. A 325-foot-long stretch of Main Road had been threatened by erosion.

Construction of the Holmes Bay project began in September 1979 and was completed in January 1980 at a cost of $207,400. It was built under Section 14 of the Corps' Continuing Authorities Program.

Islesboro (The Narrows)

Islesboro is a 12-mile-long island in Penobscot Bay, about three miles east of Lincolnville and 30 miles south of Bangor. Islesboro can be reached by ferry from Lincolnville. The project site is situated in the central portion of the island in an area known as "The Narrows," which is only 500 feet wide and connects the northern and southern sections of the island.

Erosion along a 325-foot-long stretch of shoreline threatened Main Road, which runs parallel to the shore and is the only road connecting both halves of the island. The Corps constructed about 325 feet of stone slope protection on the shoreline to prevent further erosion and safeguard Main Road.

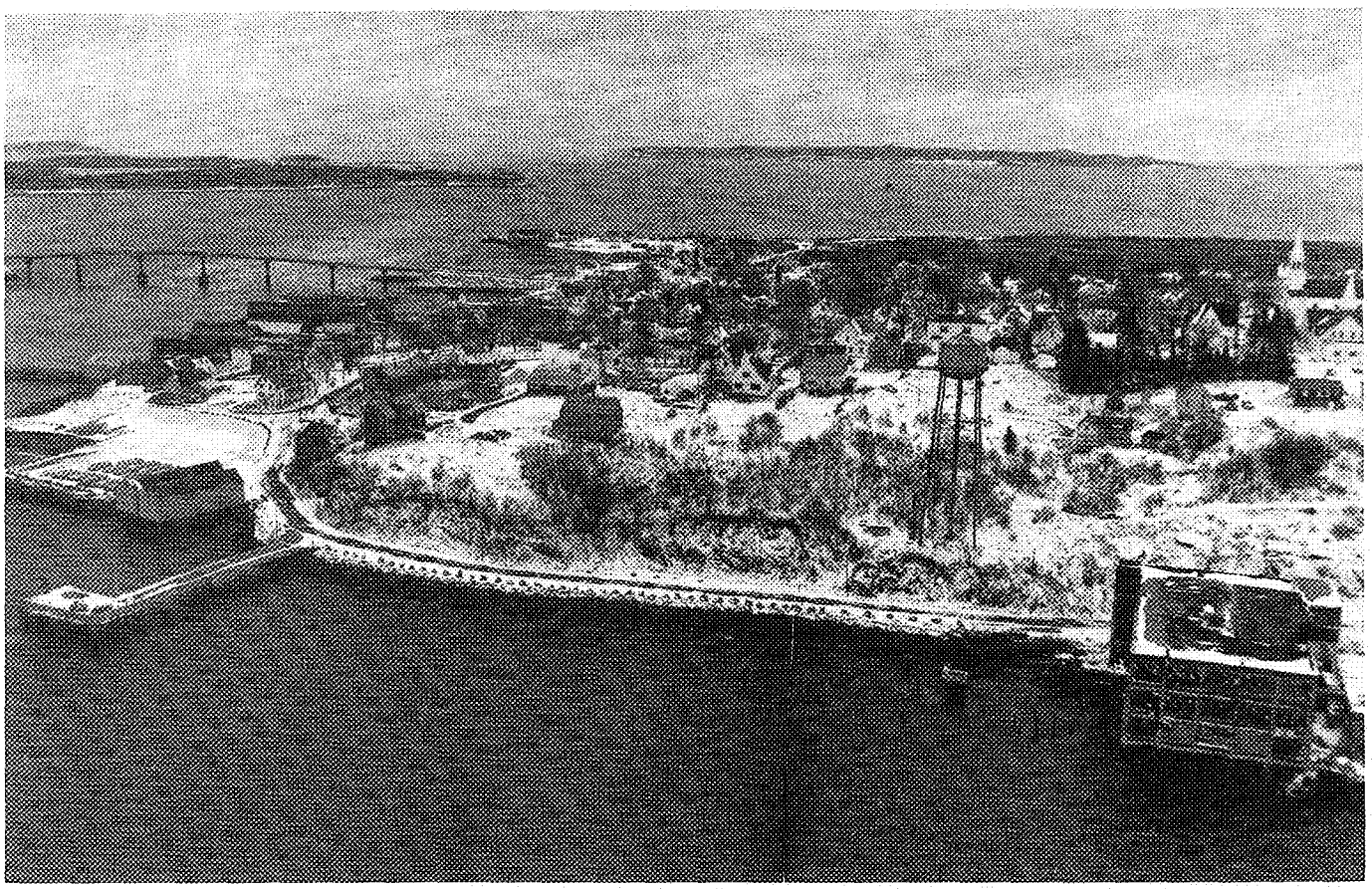
Construction began in September 1983 and was completed in March 1984, costing $165,500. The project was built under Section 14 of the Continuing Authorities Program.

Johnson Bay, Lubec

Johnson Bay in Lubec is part of the international channel that lies along the boundary between the United States and Canada. Lubec, the easternmost community in the United States, is located about two miles south of Eastport and 25 miles southeast of Calais. The project is located along the shore of Johnson Bay on the north side of Commercial Street at the northern tip of Lubec Neck.

Severe coastal storms had created a serious erosion problem along a section of Commercial Street, which is the only available route for the commercial trucks that service the area's warehouses and seafood processing plants. Corps' work consisted of removing an existing timber bulkhead and constructing 425 feet of stone slope protection along the eroded shoreline.

Construction of the Johnson Bay project was completed in two stages. The timber bulkhead was removed and about 300 feet of stone slope protection was built between December 1979 and January 1980. The project was extended by 125 feet in January 1984. The work at Johnson Bay was constructed under Section 14 of the Continuing Authorities Program and cost a total of $163,000.



The project at Johnson Bay in Lubec consists of 425 feet of stone slope protection (extending along the center of the photo, partially covered by snow, between the pier on the left and the warehouse on the right) along Commercial Street. The project halted the erosion that threatened the only route that services the area's seafood processing plants.

Little River, Belfast

The Little River discharges into Belfast Bay in Belfast, which lies 20 miles south of Bangor at the junction of the Passagassawakeaug River and Belfast Bay.

The Little River Lower Dam, owned by the Belfast Water District, is located about two miles south of the center of Belfast and about 700 feet upstream from the river's confluence with Belfast Bay. The reservoir impounded by the dam served as a primary source of water for a poultry plant until 1979, when the plant was destroyed by flooding. The reservoir now serves as an emergency water supply source for Belfast.

Tidal fluctuations, currents from water flowing over the dam's spillway, ice flows, and weathering of the bedrock had caused erosion of about 60 feet of the streambank adjacent to the dam's southern abutment. If allowed to continue, erosion would have caused a breach in the dam. To prevent continuing erosion, the Corps constructed a precast concrete modular wall, 80 feet long and 10-20 feet high. The modules are back-filled with earth materials and supported on a concrete footing bearing on bedrock.

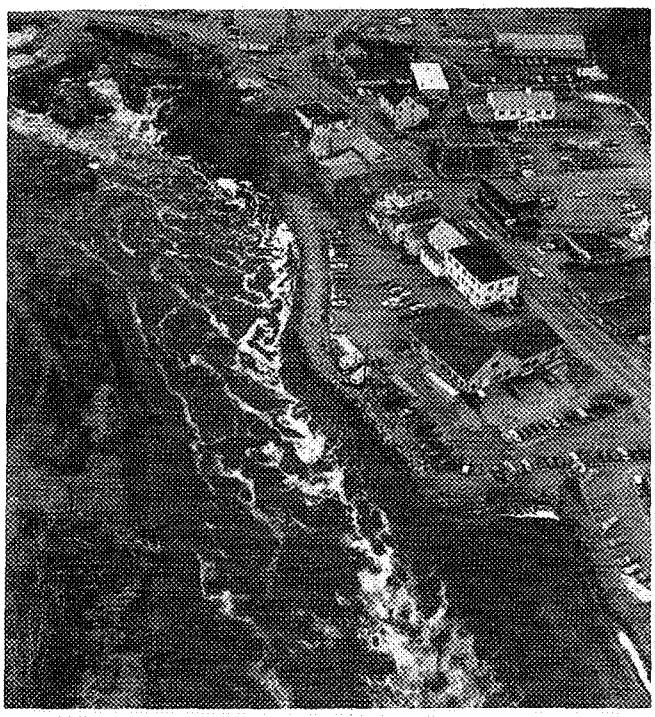
Construction was completed in December 1989 at a cost of $122,000. The project was built under Section 14 of the Corps' Continuing Authorities Program.

Machias River, Machias

The project on the Machias River in Machias is located on the north bank of the river, adjacent to a municipal parking lot near the base of Machias Falls and downstream of the Route 1 Bridge. The site is about 83 miles east of Bangor and 46 miles southwest of Eastport.

The north bank of the river at this location was exposed to strong flows from Machias Falls, particularly during flood periods. This factor, combined with the impact of ice blocks driven against the embankment by the high river currents during the late winter and spring, caused significant erosion and threatened the integrity of the parking lot, which is the major source of parking for the downtown business district. In 1973, the Federal Disaster Assistance Administration placed stone slope protection along a 500-foot section of the north bank, adjacent to the parking lot. However, storms in February and April of 1976 destroyed part of this work and the town could not obtain funds to repair it. Although the remainder of the project adequately protected the riverbank, the section of bank left unprotected suffered serious erosion and threatened the stability of the parking lot.

To strengthen the eroded bank and protect the parking lot, the Corps placed 250 feet of stone slope protection along the



The Corps' bank protection project on the Machias River in Machias (adjacent to the parking lot on the river's right bank), stopped the erosion of the bank and protects the major source of parking for the downtown business district.

exposed riverbank. Guard rails were placed along the edge of the stone protection to eliminate encroachment from the parking area.

Construction of the Machias River bank protection project began in October 1986 and was completed in June 1987 at a cost of $167,000. It is a small project and was built under Section 14 of the Corps' Continuing Authorities Program.

Machias River, Machiasport

The Town of Machiasprot is located on the northeast coast of Maine, approximately 30 miles northeast of Bar Harbor, 170 northeast of Portland, and 70 miles southeast of Bangor, Maine.

Erosion along the Machias River threatened a stretch of State Highway Route 92. Continued erosion and subsequent failure of the highway would adversely impact the population living and commuting on the Machiasport peninsula. Over 300 private residences, one elementary school, a state prison, two U.S. Post Offices, three churches and a commercial fishing harbor would be severely impacted.

The measures, which were constructed in 1994, consist of stone slope protection along 370 feet of the streambank along the west side of the Machias River. Constructed of a 30-inch layer of stone protection over layers of compacted gravel fill and stone bedding, the measures extend about seven feet above the mean high water elevation, providing protection to the highway.

Marginal Way, Ogunquit

Marginal Way is in Ogunquit, a popular recreational resort on the coast of Maine located about 15 miles north of Portsmouth, New Hampshire, and 40 miles southwest of Portland. The town's two major attractions are Ogunquit Beach and Marginal Way.

Marginal Way is a public footpath that starts near the center of town and follows the edge of the ocean atop rugged cliffs to Perkins Cove. The walkway is 1.5 miles long and was constructed in 1926 on land donated by abutting property owners. Marginal Way's two beaches and numerous scenic vistas annually attract approximately 50,000 visitors who enjoy its beauty and elegant charm. Marginal Way is within walking distance of the center of Ogunquit, and a trolley provides convenient transportation during the summer.

A 390-foot-long reach at the northern section of the walkway, near the mouth of the Ogunquit River, was subject to severe erosion from wave attack during coastal storms. About 150 feet of this section was washed out during a coastal storm in November 1983, and was rebuilt by the town with stone slope protection. The remaining 240 feet, immediately north of the rebuilt portion of the walkway, was left unprotected and was in immediate danger of suffering severe coastal storm damage.

To help protect this valuable natural resource, the Corps placed stone slope protection along the exposed 240 feet of walkway. Construction was accomplished between January-April 1987 and cost $250,000. The work was built under Section 14 of the Corps' Continuing Authorities Program.

Merriconeag Sound, Harpswell

Merriconeag Sound in Harpswell lies in Casco Bay, adjacent to Potts Harbor. Harpswell is a coastal peninsula located nine miles south of Brunswick.

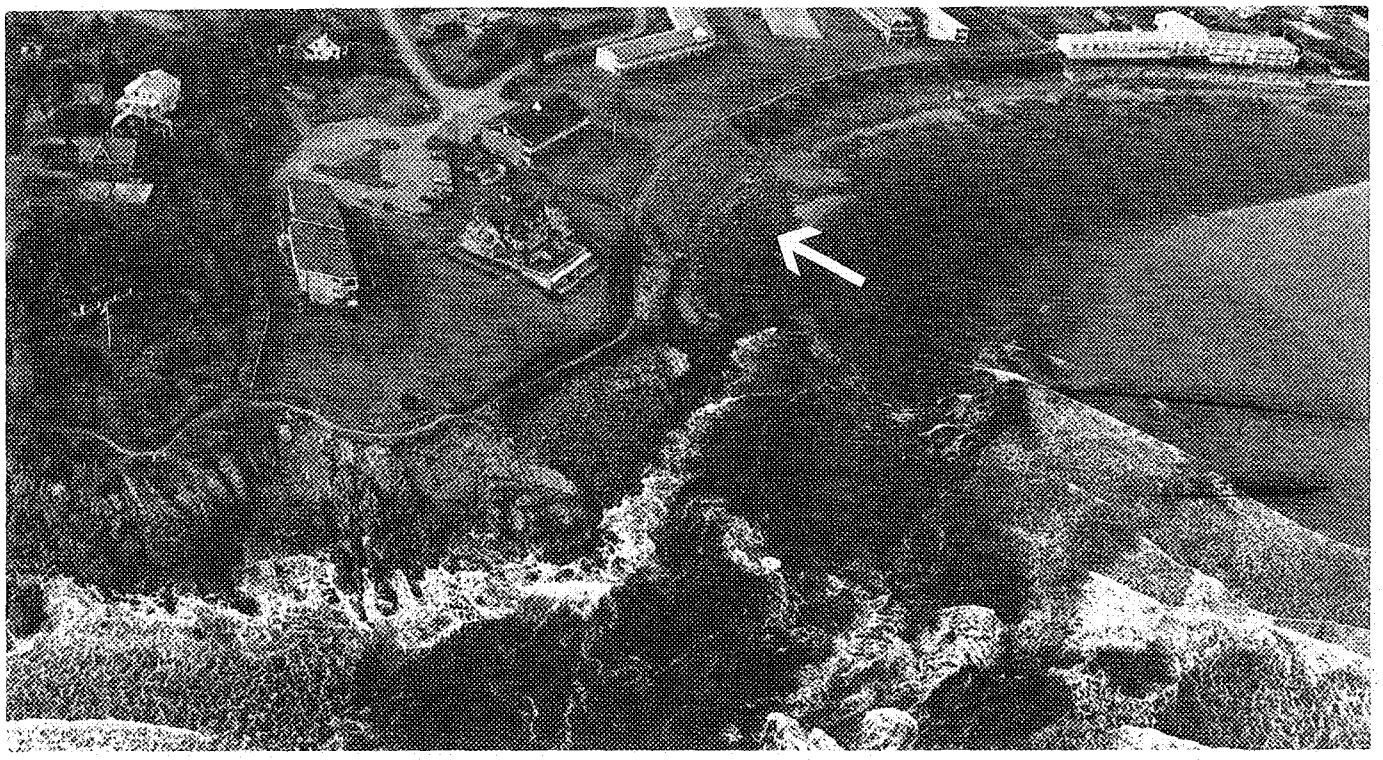
Tides and wave action in Merriconeag Sound caused severe erosion of the shoreline and endangered an historic 19th century cemetery in Harpswell, on the peninsula's southern end. To strengthen the shore and protect the cemetery, the Corps constructed a 270-foot-long concrete seawall, having a maximum height of 10 feet and a minimum height of five feet.

The work in Merriconeag Sound was constructed under Section 14 of the Corps' Continuing Authorities Program. It was built between August-December 1979 at a cost of $107,700.

Narraguagus River, Milbridge

The Town of Milbridge is located on the northeast coast of Maine, approximately 20 miles norhteast of Bar Harbor, 150 miles northeast of Portland and 50 miles southeast of Bangor.

Erosion along a section of the Narraguagus River threatened a protion of U. S. Route 1A. Failure of the heavily travelled highway would result in a five mile detour for commercial and private vehicles.



About 240 feet of stone slope protection helps protect Marginal Way, a public footpath visited by thousands each year who enjoy the beautiful natural surroundings.

Streambank stabilization, which was constructed in 1994, consists of stone slope protection over layers of sand, compacted gravel fill and stone mean high water elevation, providing protection to the top of the road.

Perley Brook, Fort Kent

Perley Brook is a tributary of the Fish River and is located in Fort Kent, about fifty miles northwest of Presque Isle. Continuing erosion caused by high spring stream flows had threatened the Route 161 highway embankment. The erosion was occurring in a 100-foot-long area adjacent to two culverts that carry Perley Brook under the roadway.

To stem the problem, the Corps constructed a streambank stabilization project which includes 100 linear feet of stone slope protection along Perley Brook, gabion slope protection at the culvert entrance on the roadway embankment and removal of an approximately 1,500 square foot shoal area to improve channel alignment.

The project was completed in 1989 at a cost of $55,000.

Pleasant Point, Perry

The Pleasant Point Indian Reservation, owned by the Passamaquoddy Tribe, is located on Pleasant Point along the Western Passage of Passamaquoddy Bay in Perry, directly across from New Brunswick, Canada. Perry is about 125 miles east of Bangor and six miles north of Eastport. The Reservation, located approximately two miles southeast of U.S. Route 1 on Route 190, covers about 100 acres of land and is bordered on three sides by Passamaquoddy and Cobscook Bays.

A 1,000-foot-long reach of Pleasant Point's eastern shore, adjacent to an abandoned railroad embankment, was subject to erosion from ocean currents and tidal flucuations. Large ice fragments, some as big as 30 square feet and 18 inches thick, regularly flow though the Western Passage during the late winter and early spring and scrape along the shorefront, contributing significantly to the erosion process. These natural forces had attacked the shoreline to the point where only 10 feet separated the eroding bank from two homes. In 1986, a storm washed away the porch stairway foundations of these homes, putting them in immediate danger and threatening four other homes on the shoreline. Erosion also threatened property set back from the shoreline, including an elderly housing project, a church, and a sewage treatment facility.

The Corps responded by constructing stone slope protection along 800 feet of the eroded shoreline. The project stabilizes and strengthens the shoreline and reduces the threat of erosion along the Pleasant Point Reservation. A gravel walkway runs along the the top of the stone protection for its entire 800 feet.

Project construction began in October 1986 and was completed in June 1987. The work cost $193,000 and was built under Section 14 of the Corps' Continuing Authorities Program.

Prestile Stream, Blaine

The project on Prestile Stream in Blaine is about 15 miles south of Presque Isle, 25 miles north of Houlton, and three miles west of the Maine-New Brunswick boundary. The project site is located at the Robinson Road Bridge, situated 100 feet downstream of a timber dam in Robinson, a section of Blaine.

In April 1976, the high flows of Prestile Stream washed out a 25-foot-wide section of the timber dam. The resulting surge caused erosion of the right bridge abutment, and a 40-foot-long section of Robinson Road that is located adjacent to the left bridge abutment. About 285 feet of stone slope protection was placed on both riverbanks (137 feet on the east bank, 148 feet on the west bank) to stabilize the road and bridge.

The work on Prestile Stream was accomplished between August-December 1979 and cost $73,700. It was constructed under Section 14 of the Continuing Authorities Program.

Roosevelt Campobello International Park, Canada

The project is located in the Roosevelt Campobello International Park at Mulholland Point on the southeastern end of Campobello Island in New Brunswick, Canada. The park, about 120 miles east of Bangor, is separated from Lubec by the Lubec Narrows and is accessible by the Franklin Roosevelt Memorial Bridge.

The Roosevelt Campobello International Park Commission, which was established by an international agreement between the U.S. and Canada, asked the Corps for assistance in providing shoreline protection for an historic lighthouse located along Lubec Narrows at Mulholland Point. The lighthouse was in danger from an eroding shoreline caused by extreme tides and high currents through Lubec Narrows. The resulting project, which consists of 375 feet of stone slope protection around Mulholland Point, was completed in March 1989 with a construction cost of $120,000. The project was authorized and funded by special legislation passed by the U.S. Congress.

Sand Cove, Gouldsboro

Sand Cove in Gouldsboro is located 55 miles southeast of Bangor and 12 miles east of Bar Harbor. The project site is located on the eastern shore of a narrow strip of land known as the Corea Causeway, which separates Sand Cove and Corea Harbor.

High tides and wave overtopping during coastal storms had caused erosion along the Sand Cove side of the Corea Causeway. This erosion threatened about 500 feet of public roadway, which is the only road leading to a lobster company and about 30 homes in the Youngs Point section of Gouldsboro. The road had been washed out from storms in 1969, 1976, and 1978. Following the 1978 washout, the town built a low stone wall; however, it collapsed in the early

High tides and wave overtopping had caused erosion along the Sand Cove side of the Corea Causeway, threatening about 500 feet of the only public roadway leading to the Youngs Point section of Gouldsboro. The Corps responded by constructing stone

1980s, leaving a six-foot-high eroded bank only eight feet from the paved roadway. In addition, coastal storms occasionally washed over the causeway and desposited stones from the eroded bank onto the roadway, requiring closure of the road until the rubble was removed. The 1978 storm closed the road for 14 days.

To combat the problem, the Corps built stone slope protection along a 500-foot-long stretch of the Corea Causeway's eroded bank. The project was constructed between June-August 1984 at a cost of $127,500. It was built under Section 14 of the Corps' Continuing Authorities Program.

APPENDIX

Communities with Corps Projects

The communities listed below have either Corps' lands or Corps-built projects lying within their borders. The listing indicates the project name, its purpose (Flood Damage Reduction, Navigation, or Shore and Bank Protection), and the page number in this booklet where the project is described.

Community	Project Name	
Damariscotta	Damariscotta River (Navigation)	47
Deer Isle	Stonington Harbor (Navigation)	68
Dresden	Kennebec River (Navigation)	52
East Machias	Machias River (Navigation)	54
Eliot	Portsmouth Harbor and Piscataqua River (Navigation)	60
Ellsworth	Union River (Navigation)	70
Farmingdale	Kennebec River (Navigation)	52
Fort Kent	Fort Kent Local Protection Project (Flood Damage Reduction)	36
Frankfort	Penobscot River (Navigation)	56
Freeport	Harraseeket River (Navigation)	48
Frenchboro	Frenchboro Harbor (Navigation)	48
Gardiner	Kennebec River (Navigation)	52
Georgetown	Kennebec River (Navigation)	52
Gouldsboro	Bunker Harbor (Navigation)	44
	Corea Harbor (Navigation)	46
	Sand Cove (Shore and Bank Protection)	81
Hallowell	Kennebec River (Navigation)	52
Hampden	Penobscot River (Navigation)	56
Hancock	Sullivan Falls Harbor (Navigation)	70
Harpswell	Merriconeag Sound (Shore and Bank Protection)	79
Hartland	Sebasticook River Local Protection Project (Flood Damage Reduction)	37
Isle au Haut	Isle au Haut Thoroughfare (Navigation)	49
Islesboro	Islesboro-The Narrows (Shore and Bank Protection)	77
Jonesport	Jonesport Harbor (Navigation)	50
	Moosabec Bar (Navigation)	54
Kennebunk	Kennebunk River (Navigation)	52
Kennebunkport	Cape Porpoise Harbor (Navigation)	44
	Kennebunk River (Navigation)	52
Kittery	Isles of Shoals Harbor (Navigation)	50
	Pepperell Cove (Navigation)	58
	Portsmouth Harbor and Piscataqua River (Navigation)	60
Lubec	Johnson Bay (Shore and Bank Protection)	77
	Lubec Channel (Navigation)	53
Machias	Machias River (Navigation)	54
	Machias River (Shore and Bank Protection)	78
Machiasport	Bucks Harbor (Navigation)	43
	Machias River (Navigation)	54
	Machias River (Shore and Bank Protection))	79
Matinicus Isle Plantation	Criehaven Harbor (Navigation)	46
	Matinicus Harbor (Navigation)	54

Community	Project Name	
Milbridge	Narraguagus River (Navigation)	54
	Narraguagus River (Shore and Bank Protection)	79
Mount Desert	Northeast Harbor (Navigation)	56
New Castle, N.H.	Portsmouth Harbor and Piscataqua River (Navigation)	60
Newcastle	Damariscotta River (Navigation)	47
Newington, N.H.	Portsmouth Harbor and Piscataqua River (Navigation)	60
Ogunquit	Josias River at Perkins Cove (Navigation)	50
	Marginal Way (Shore and Bank Protection)	79
Old Town	Penobscot River Local Protection Project (Flood Damage Reduction)	37
Orland	Penobscot River (Navigation)	56
Orrington	Penobscot River (Navigation)	56
Owls Head	Owls Head Harbor (Navigation)	56
Pembroke	Cobscook Bay (Navigation)	46
Penobscot	Bagaduce River (Navigation)	40
	Penobscot River (Navigation)	56
Perry	Pleasant Point (Shore and Bank Protection)	80
Phippsburg	Kennebec River (Navigation)	52
Pittston	Kennebec River (Navigation)	52
Portland	Portland Harbor (Navigation)	58
Portsmouth, N.H.	Portsmouth Harbor and Piscataqua River (Navigation)	60
Prospect	Penobscot River (Navigation)	56
Randolph	Kennebec River (Navigation)	52
Richmond	Kennebec River (Navigation)	52
	Richmond Harbor (Navigation)	61
Rockland	Rockland Harbor (Navigation)	62
Rockport	Rockport Harbor (Navigation)	62
Rye, N.H.	Isles of Shoals Harbor (Navigation)	50
Saco	Saco River (Navigation)	64
St. George	Tenants Harbor (Navigation)	70
St. Stephen, New Brunswick	Saint Croix River (Navigation)	65
Scarborough	Scarborough River (Navigation)	67
Searsport	Searsport Harbor (Navigation)	67
South Bristol	South Bristol Harbor (Navigation)	68
South Portland	Portland Harbor (Navigation)	58
Southport	Hendricks Harbor (Navigation)	49
Southwest Harbor	Southwest Harbor (Navigation)	68
Stockton Springs	Penobscot River (Navigation)	56
	Stockton Harbor (Navigation)	68

Community	Project Name	
Stonington	Deer Island Thoroughfare (Navigation)	47
Sullivan	Sullivan Falls Harbor (Navigation)	70
Thomaston	Saint George River (Navigation)	67
Tremont	Bass Harbor (Navigation)	40
	Bass Harbor Bar (Navigation)	40
Verona	Penobscot River (Navigation)	56
Vinalhaven	Carvers Harbor (Navigation)	45
Waldoboro	Medomak River (Navigation)	54
Wells	Wells Harbor (Navigation)	70
Whiting	Holmes Bay (Shore and Bank Protection)	76
Winter Harbor	Winter Harbor (Navigation)	71
Winterport	Penobscot River (Navigation)	56
Woolwich	Kennebec River (Navigation)	52
	Sasanoa River (Navigation)	67
Yarmouth	Royal River (Navigation)	63
York	York Harbor (Navigation)	72

Glossary

Anchorage—an area dredged to a certain depth to allow boats and ships to moor or anchor.

Bedrock—rock of relatively great thickness lying in its native location.

Breakwaters—structures, usually built offshore, that protect the shoreline, harbor, channels, and anchorages by intercepting the energy of approaching waves.

Bulkheads—steel sheet piling or timber walls that prevent sliding of the land and protect the streambank or shoreline from erosion.

Conduits—concrete tunnels or pipes that divert floodwaters around or under potential flood damage sites.

Culverts—large pipes, usually constructed below bridges and other water crossings, that allow water to pass downstream and provide support to the crossing.

Dikes—earthfill barriers that confine floodwaters to the river channel, protecting flood prone areas.

Drainage Area—the total land area where surface water runs off and collects in a stream or series of streams that make up a single watershed.

Drop Structure—a device in a stream or channel that prevents water from rising above a certain elevation. Once water reaches a certain level, excess water passes over the structure and is diverted to another body of water.

Earthfill—a well graded mixture of soil containing principally gravel, sand, silt, and clay, which is used with other materials to construct dams, dikes, and hurricane protection barriers.

Environmental Assessment—an examination of the positive and adverse impacts on the environment of a proposed water resources solution and alternative solutions.

Environmental Impact Statement—a detailed environmental analysis and documentation of a proposed water resources solution when the proposed solution is expected to have a significant effect on the quality of the human environment or the area's ecology.

Feasibility Study—a detailed investigation, conducted after the reconnaissance study is completed, that recommends a specific solution to a water resource problem.

Floodplain—the land adjoining a river, stream, ocean, or lake that is likely to be flooded during periods of excess precipitation or abnormal high tide.

Floodproofing—structural measures incorporated in the design of planned buildings or alterations added to existing ones that lessen the potential for flood damage. For example, existing structures could have their basement windows blocked, or structures in the design stage could be built on stilts or high foundations.

Floodwalls—reinforced concrete walls that act as barriers against floodwaters and confine them to the river channel, protecting flood prone areas. Floodwalls are usually built in areas with a limited amount of space.

Gabion Wall—a retaining wall constructed of stone-filled wire mesh baskets.

Groins—structures that extend perpendicular from the shore in a fingerlike manner to trap and retain sand, retarding erosion and maintaining shore alignment and stability.

Hurricane Protection Barriers—structures built across harbors or near the shoreline that protect communities from tidal surges and coastal storm flooding. They are often constructed with openings for navigational purposes.

Intake Structure—found at the entrance to a conduit or other outlet facility, an intake structure allows water to drain from a reservoir or river and is equipped with a trash rack or other feature that prevents clogging from floating debris.

Jetties—structures that stabilize a channel by preventing the buildup of sediment and directing and confining the channel's tidal flow. Jetties are usually built at the mouth of rivers and extend perpendicular from the shore.

Outlet Works—gated conduits, usually located at the base of a dam, that regulate the discharge of water.

Pumping Station—a structure containing pumps that discharges floodwaters from a protected area over or through a dike or floodwall and into a river or ocean.

Reconnaissance Study—a preliminary study that examines a wide range of potential solutions to a water resources problem, each of which is reviewed for its economic and engineering practicality, acceptability, and impact on the environment.

Recreation Pool—any permanent body of water impounded by a dam that offers recreational opportunities or promotes fishery and wildlife habitat.

Retaining Walls—walls made of stone, reinforced concrete, precast concrete blocks, or gabion that support streambanks weakened by erosion.

Revetment—a facing of stone or concrete constructed along a backshore or riverbank to protect against erosion or flooding.

Sand Drain—a layer of pervious materials, such as sand and gravel, placed beneath the downstream section of a dam that carries seepage to the dam's downstream limits and out into the stream.

Sand Replenishment—quantities of sand placed on a shoreline to restore or widen a beach's dimensions. Sand replenishment strengthens beaches affected by erosion, protects the backshore from wave action, and stops the inland advance of water.

Seawall—a reinforced concrete wall built along a shoreline to protect against erosion or flooding.

Snagging and Clearing—the removal of accumulated snags and debris, such as fallen trees, dead brush, and silt, from river and stream channels. Snagging and clearing improves a channel's flow capacity and eliminates a potentially dangerous flood situation.

Spillway—a channel-shaped structure, usually made of concrete or excavated in rock, that allows water exceeding the storage capacity of a reservoir to pass through or around a dam instead of overtopping it.

Stone Slope Protection—a layer of large stones, usually underlain by a layer of gravel bedding, designed to prevent erosion from streamflow, wave attack, and runoff.

Stoplog Structure—a designed opening in a floodwall or dike that allows the passage of water during non-flood periods but closes during flood periods to prevent flooding downstream. Stoplog structures can be made of wood or steel or concrete beams.

Training Dike—a structure extending from the shore into the water that redirects the current, preventing sediment from settling and ensuring that adequate depths are maintained.

Training Wall—a structure built along channel banks to narrow the channel area, thereby controlling the velocity of the flow of water and preventing the buildup of sediment. Training walls and training dikes have the same purpose: to ensure adequate depths are maintained.

Vehicular Gate—an opening in a dike or floodwall that allows rail cars or other vehicles to pass over the structure during nonflood periods. Vehicular gates can be closed during flood periods by either stoplogs or large steel gates.

Weir—a concrete structure designed as part of the spillway that allows water to flow from the reservoir and over the spillway.

Index